CERCLA Expanded Site Inspection Report

Illinois Environmental Protection Agency

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EXPANDED SITE INVESTIGATION REPORT

for

SANDOVAL ZINC COMPANY
SANDOVAL, ILLINOIS
ILD053980454

PREPARED BY:
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
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1.0 SITE BACKGROUND

1.1 INTRODUCTION

On September 30, 1994, the Illinois Environmental Protection Agency's (IEPA) Site Assessment Program was tasked by the U.S. Environmental Protection Agency (U.S. EPA) to conduct an Expanded Site Investigation (ESI) of the Sandoval Zinc Company (ILD053980454) site located in Sandoval, Illinois. The ESI is performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

On December 1, 1983 Sandoval Zinc Company was placed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) in response to concerns that past site activities may have resulted in soil and sediment contamination on site and throughout the surrounding area. The Illinois EPA conducted a Preliminary Assessment at the site in 1986 and a Screening Site Inspection in 1988. Mr. Ken Corkill of Illinois EPA's Site Assessment Unit prepared a workplan for ESI field activities which was submitted to U.S. EPA on May 3, 1996. The field activity portion of the ESI was conducted on May 23-24, 1996. The activities of the ESI included a reconnaissance inspection, an internal file review, information collected from external sources and the collection of twenty-nine soil and seven sediment samples from, both, on and off the Sandoval Zinc property. Twenty-four of the twenty-nine soil samples were obtained from yards of private residences or local businesses. Duplicate and background samples of each media are included in the number of samples mentioned above.

Illinois EPA performed ESI activities for the site to fill information gaps which may have

existed from previous CERCLA investigations and to determine whether, or to what extent, the site poses a threat to human health and the environment. The ESI report presents the results of Illinois EPA's evaluation and summarizes the site conditions and targets of concern to the migration and exposure pathways associated with the site.

1.2 SITE DESCRIPTION

The Sandoval Zinc site is located east of the Village of Sandoval, approximately 1440 feet (0.27miles) east of U.S. Route 51 and 2240 feet (0.42 miles) south of U.S. Route 50 at the eastern end of Smelter Road (aka. Mississippi Ave.). The site consists of 14.16 acres of property located in the S ½ of the SE 1/4 of the NE 1/4 of Section 17, Township 2 North, Range 1 East, in Marion County, Illinois (Figures 1 & 2). The property is bounded to the east by open field, to the south by open field, to the west by a vacant parcel of land containing various types and sizes of vegetation (grass, weeds, bushes, trees, etc.), and to the north by the CSX Railroad tracks. North, across the tracks is open field, wetlands and Village property (proposed to eventually be a park), currently unimproved. Surface water runoff routes are noticeably present flowing from the site and near the boundaries of the property. Runoff from the site itself follows a radial type pattern due to the site being slightly higher in elevation at its middle than at its perimeter. An intermittent drainage way running from north to south, located approximately 300 feet west of the sites western perimeter, collects runoff from the western portion of the site. This portion of the sites runoff tends to accumulate in low areas along the north and south perimeters of the site prior to flowing separately to the intermittent drainage way. Another intermittent drainage way running from north to south flows through the eastern portion of the

site. This drainage way enters the property approximately 300 feet west of the northeast corner of the property and exits at the southeast corner. The drainage way through the property takes a north to south route until the channel is 100 feet north of the south perimeter where it bends to the east (Figure 3 & 4). Approximately 250 feet east of said bend the channel bends to the southeast then exits the property 30 feet north of its southeast corner. Both intermittent drainage ways empty into Prairie Creek (Figure 5). Prairie Creek is a perennial water way located approximately 2000 feet south of the southeastern corner of Sandoval Zinc flowing in a southwesterly direction. The eastern intermittent drainage way empties into Prairie Creek at this point. The western intermittent drainage way empties into Prairie Creek approximately 3500 feet southwest of Sandoval Zinc property (Appendix A, 4-mile map) .

Sandoval Zinc Co. can be accessed by vehicle via asphalt and gravel road which runs east from U.S. Route 51 and through a locked gate at the southwest corner of the property. Two large buildings and one small office building currently exist on the property. These structures are in various stages of disrepair. During the summer of 1990 a fire in the northern most building caused steel I-beams to melt resulting in the collapse of a large portion of the buildings roof and portions of its walls. There is no activity and no caretaker or guards on the property. As a result of this, although the property has been officially sealed by the IEPA including a fence constructed around the entire perimeter, the property has, on numerous occasions, been accessed by local residents. This has been accomplished by breaching the chain link fence with various types of vehicles. Each time the fence is damaged IEPA makes the necessary repairs only to have the process repeated.

The property is located in an area of south central Illinois where surficial terrain has been

shaped by various types of glacial action and deposition. The land surface has been modified by glacial activity into the relatively flat to gently rolling plains characteristic of glacial drift regions. The topography surrounding the site is relatively flat and lies at approximately 500 to 505 feet above mean sea level (MSL). An artificial mound of cinders and other fill material has raised the elevation of the central portion of the site to approximately 510 feet MSL. The site surface slopes gently to the lower elevations on all sides, except to the east, where a rapid drop of about five feet occurs, down to the eastern drainage channel. East of this channel is an on-site pond. The pond was used by Sandoval Zinc as a process water supply. Established vegetation ranging from grasses to mature trees is present around the pond with no visible evidence of stress to said vegetation.

1.3 SITE HISTORY

The Sandoval Zinc Company smelter facility began operating as a primary zinc smelter between 1885 and 1890. In approximately 1915, the operations were converted to secondary zinc smelting. Compounds fed into the kilns were pure zinc, zinc oxide, zinc chloride, possibly aluminum chloride and other trace metals. The facility remained a secondary smelter until the facility was closed in 1985. On June 27, 1972, the plant was almost completely destroyed by fire. The buildings were rebuilt and the plant continued operating until 1985. In December, 1986, the Sandoval Zinc Company was officially dissolved and the owners declared bankruptcy.

The Sandoval Zinc Co. property is currently owned by White Brothers Salvage & Recycling, Inc. by warranty deed recorded October 25, 1989. The current owner received title from Albert F. Haas per warranty deed referred to above. Albert F. Haas received title per

corporation deed from Sandoval Zinc Co. executed on March 14, 1988. Sandoval Zinc has been identified as the owner and operator of the site during periods when releases took place.

During the first eighty-five years of operation, the principal waste emissions from the plant were metal laden cinders and windblown ash. Large quantities of cinders from the smelting process were used in constructing and surfacing secondary roads in the plant and as fill material on the property. Cinders not able to be utilized by the plant, in the ways mentioned, were placed into large piles on the property and offered to the public and City for use in constructing and surfacing roadways, driveways, sidewalks, and parking lots. Due to filling on site, layers of cinders range from one to ten feet thick over the twelve acre parcel. Many areas throughout the City still exhibit evidence of the former use of cinders. Probing adjacent to driveways and side walks reveal cinders, some of which have been covered with concrete. The windblown ash was emitted from the smelter stacks for many years. This ash settled on the plant site and the surrounding community and farmland. Typically, ash from secondary zinc smelters using retort furnaces is high in concentrations of heavy metals. The volume of ash emitted from retort stacks averaged between 50 to 100 tons per year. Additional sources of wind-borne emissions may have resulted from handling practices of plant waste products. This might have included open storage of waste cinders and ash and bulk storage of products, mostly zinc oxide. The zinc oxide was stored inside plant building which would have somewhat reduced wind-borne emissions. In 1970, in compliance with air pollution regulations, a stack scrubber was installed. Wastewater from the scrubber was pumped to a seepage pit on site which allowed sludge to settle out. The sludge was then removed for zinc reclamation. The exact locations of this and another pit on site are not known at this time. Additional historical activities occurring on site are

presented in section III of the May 20, 1996 4(q) notice (Appendix E).

1.4 REGULATORY STATUS

Sandoval Zinc Company has had numerous complaints registered against it, mainly due to its stack emissions. Attorneys representing an area farmer contacted IEPA in 1987 alleging that the farmers land and crops had been contaminated with lead and zinc from the site. A June 1987 analysis by the Illinois Department of Agriculture of soybean plants from the subject field indicated healthy looking plants contained zinc at 260 ppm while dying plants contained zinc at 933 ppm. Analysis of water and sediment samples collected by IEPA personnel on March 30, 1987 from the west and east drainage ditches adjacent to the site revealed evidence that zinc and cadmium discharges had occurred over time. Levels found in the water samples exceeded surface water quality limits. Therefore Sandoval Zinc was/is in violation of the ambient surface water quality limits set forth in Title 35, Subtitle C: Water Pollution, Section 304.124. The facility is not subject to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Atomic Energy Act (AEA), or Uranium Mine Tailings Radiation Control Act (UMTRCA).

2.0 EXPANDED SITE INSPECTION ACTIVITIES

2.1 INTRODUCTION

This section contains information gathered during the preparation of the formal CERCLA Expanded Site Inspection and previous Illinois Environmental Protection Agency's activities involving the Sandoval Zinc Company site. Specific activities included an internal file search, field reconnaissance inspections, site representative interviews, and a sampling visit of the surrounding area and the facility.

2.2 RECONNAISSANCE ACTIVITIES

On May 1, 1996, Mr. Ken Corkill of Illinois EPA's Site Assessment Unit conducted a reconnaissance inspection of the Sandoval Zinc Company property and surrounding area. Upon arrival this day the site was noted to be closed and there were no activities at the site. Access has been restricted by use of a chain link fence surrounding the site since the Agencys Seal Order in 1991. No one was present on site. Areas included in the inspection were the potential surface water drainage routes leading from the property, residential areas near the site, potentially contaminated farm fields adjacent to the site in all directions, on-site soils, buildings and contents on site and a pond east of the facility. The information attained during the reconnaissance and additional information gathered on May 22 and 23, 1996 is included in the site description in Section 1.2 of this report.

2.3 REPRESENTATIVE INTERVIEWS

There were no property representatives present at the time of the site reconnaissance. In lieu of the site representative interview, Mr Mark Britton of the Bureau of Land community relations section arranged for interviews of long time residents of Sandoval. Some of the persons interviewed had been employees of Sandoval Zinc, while one gentleman was the City Historian. Information obtained from these individuals are set forth in this section of the text. All individuals interviewed have indicated that the plant frequently (almost every day) emitted a white odorous smoke, described as being like fog, which would, during many days, hang at ground level and you couldn't see through it. The furnaces producing the smoke were fired up during the morning hours after sunrise. This smoke was noted to be most prevalent during the fall and winter months. About every other day the wind would blow from the east, covering the town with smoke which would be present most of the day. Often the smoke was present past Sandoval High School, 1 1/4 miles west of the zinc plant. On some summer evenings the drive-in theater, formerly located north of the plant, had to be closed due to smell and/or smoke from Sandoval Zinc (see Appendix F). On numerous days many employees went home sick due to smoke inhalation. The result of this smoke inhalation was headaches, chills, and vomiting. Recovery was said to take as much as eight hours.

The people interviewed also indicated that cropland surrounding Sandoval Zinc was adversely affected by the smelting operations. Particulate fallout from stack emissions and the potential contaminants associated with the fallout has been blamed for poor cropland and crop production or no crop production at all near the Sandoval Zinc plant. South and east of the Sandoval Zinc property and south and east of the former drive-in crops were historically very

stressed and did not grow properly. No crops were able to be grown southwest and west of the former drive-in and northwest of Sandoval Zinc. These conditions were noted to be evident during the period of time in which the plant operated and continued to be the case until a few years ago when some crops were able to be grown again. The only crop able to grow under the previous conditions was asparagus, which was mainly volunteer growth.

Various materials were shipped to Sandoval Zinc throughout its existence. Three of these types of materials were elaborated on by two persons interviewed. The majority of shipments being received by Sandoval Zinc were by railroad while a lesser number were by truck. Shipments from Sandoval Zinc were accomplished mainly by means of trucks. Power plants and steel mills shipped skimmings to Sandoval Zinc in 55-gallon drums in powder form. Steel mills shipped a black liquid substance mixed with a powdered substance in 55-gallon drums. St. Joe Lead Company was indicated to have shipped 55-gallon drums of a hardened substance (liquid when initially placed into the drums) to Sandoval Zinc Company. Drums of the latter substance, when received, were split open and allowed to weather. After weathering, for an undisclosed amount of time, this substance was mixed with skimmings, run through a ball mill and then through a furnace which produced zinc ash (zinc oxide) and waste. Zinc oxide was sold as a paint additive and fertilizer. This process was indicated to take place between 1972 and 1985. The black liquid, which arrived at Sandoval Zinc, was refined at a temperature of approximately 1500-1600 degrees Fahrenheit. After this process was completed the liquid was placed into open top concrete tanks for storage prior to being placed into 55-gallon drums for shipment to paint manufacturers. The location of these tanks was not disclosed. Waste produced during the various operations on site was mainly cinders from the firing of the

furnaces. Originally a horse and cart were used to haul cinders to different locations on site for fill. In the 1930's during the P.A. days the federal government provided Sandoval Zinc with a crusher which would crush cinders prior to being hauled off site via a tractor and wagon. The cinders were hauled into the City of Sandoval and used to pave roads, driveways, alleys and parking lots. These cinders were also used throughout the county in the same capacity. One individual indicated that the cinders were also hauled to Junction City for similar use. During construction of the high school in the 1940's cinders were utilized to pave the circle drive in front of the school but were not used in constructing the running track north of the school.

Sandoval Zinc Company was described during the interviews as being a smelting operation from the late 1880's until 1965, producing bar zinc (see Appendix F). During this time there were two types of furnaces used. Retort furnaces were used until 1957 after which kettle furnaces were put into service. Operations were changed to fertilizer manufacturing in 1965 which continued through early 1972. No smelting operations occurred during this time. In June 1972 the plant was almost completely destroyed by fire. After the plant was rebuilt it again was a smelting operation producing zinc oxide from 1973 until the plant closed in 1985.

Numerous persons in Sandoval were indicated to have had or have health problems. Many were or are past employees of Sandoval Zinc Company. A number of these individuals died during the mid 1960's, some of which were diagnosed with and died of emphysema. These persons were said to have been struck with illness during their 40's or 50's and died in their 60's. No studies have been conducted to determine whether or not stack emissions etc. from Sandoval Zinc Company were or are the cause of some of the various illnesses and deaths in Sandoval. An instance was also noted regarding death of cattle between 1910 and 1912. Information is

sketchy but indications are that cattle (unknown number) died after drinking water from Prairie Creek which flows west-southwest approximately 1/4 mile south of the southeast corner of the Sandoval Zinc property. The creek receives site runoff via intermittent streams located along both, the east and west property boundaries. No cause of death was revealed to the author. This information has either been lost over time, inconclusive or was never determined. The pond located east of the Sandoval Zinc property was used in the early days of the retort furnaces to blow them out. Nothing was known to have been placed into the pond throughout the companys existence. Until the depression era the pond was used by residents for fishing and swimming. However, following construction of community pools after the depression the pond was not frequently used.

2.4 SAMPLING ACTIVITIES AND RESULTS

On May 22 & 23, 1996, Illinois EPA personnel collected twenty-nine samples from within the Sandoval Zinc Company property and in the surrounding community. Samples collected consisted of four soil samples from within the property boundaries of Sandoval Zinc Company, one soil sample adjacent to the pond east of the Sandoval Zinc property, twenty-four soil samples from residential locations in the City of Sandoval and seven sediment samples from the two intermittent drainage ways east and west of the property and from Prairie Creek south of the property. The on-property samples were collected to help determine the type of contaminants present and concentration of the contaminants within the fenced property boundaries of Sandoval Zinc Company. The off-property soil samples and sediment samples were obtained to determine if any potential site contaminants were migrating off-property via overland flow migration or

have been transported beyond property boundaries via wind-borne stack emissions and handling of plant wastes, ie. open storage of cinders and ash and bulk storage of zinc oxide in bins in plant buildings. Additional discussions concerning the analytical results of these samples and their impact on the various migration pathways may be found in Section 4.0 of this ESI report (Migration Pathways). Figures 4, 7 & 8 illustrate the locations of each soil and sediment samples. Table 5 describes each soil sample with its location, depth, and physical appearance. Tables 1 & 2 provides an overall summary of soil and sediment samples collected during this ESI investigation. Tables 3 & 4 provide a summary of key soil and sediment samples in which contaminants were detected at concentrations at least three times background levels for respective media.

The five soil samples collected from on the Sandoval Zinc property, one of which was collected adjacent to the pond, revealed elevated levels of a few volatile constituents, and several semivolatile, pesticide and inorganic constituents. Sample X104 was designated as the background location for volatile, semivolatile and pesticide constituents for samples X101 - X105. This designation for these constituents, not including inorganic constituents, was due to these five samples being the only samples analyzed for the entire Target Compound List (TCL). Samples X101 - X103 and X105 contained many constituents at levels equal to or greater than three times background levels. All other soil samples (X106 - X129) were analyzed exclusively for the inorganic fraction of the TCL. The background location for these samples is sample X108. The inorganic fraction of samples X101 - X105 were also compared to X108. Analysis of the inorganic fraction of samples X101 - X129 revealed elevated levels of various constituents in all samples, many of which were at levels equal to or greater than three times background

levels. All constituents detected in the soil samples are listed in Table 1. None of the constituents listed in the Soil Key Sample Summary Table (Table 3) was detected above CERCLA Removal Action Levels (RAL's). For a list of semi-volatile compounds considered to be PNA's, please refer to the Target Compound List found in Appendix D. Photographs of the IEPA's May 1996 sampling event are presented in Appendix E of this report.

Sediment sampling consisted of collecting seven samples at six locations near the Sandoval Zinc property. All sediment samples were analyzed for the Target Compound List constituents. Two locations were in the drainage way west of the property, two were located in the eastern drainage way which bisects the property and two were located in Prairie Creek south of the property. Sample X204 was designated as the background location for samples X201 - X207. Elevated levels of all fractions analyzed were detected in these samples many of which were at levels equal to or greater than three times background levels. All constituents detected in the sediment samples are listed in Table 2. None of the constituents listed in the Sediment Key Sample Summary Table (Table 4) was detected above CERCLA Removal Action Levels (RAL's). For a list of semi-volatile compounds considered to be PNA's, please refer to the Target Compound List found in Appendix D. Soil and sediment samples collected from both, on and off site were compared with either Maximum Contaminant Levels (MCL's) or Soil Remediation Objectives for Residential Properties as set forth in Tier 1 of the July 1997 IEPA authored Tiered Approach to Corrective Action Objectives (TACO) document. Any constituents with concentrations above corresponding remediation objectives, MCL's or RAL's are highlighted in Tables 3 & 4, the Soil and Sediment Key Sample Summary Tables, respectively. Constituent concentrations which are not highlighted are below action levels.

A complete analytical data package for the Sandoval Zinc Company site is located in Appendix H, under a separate cover in Volume 2 of the ESI report. Also included in Volume 2 in Appendix I are Tables 4-1 through 4-9 which compile information from previous reports.

3.0 SITE SOURCES

3.1 CONTAMINATED SOIL (ON SANDOVAL ZINC PROPERTY)

During the May 1996 ESI sampling event five soil samples were collected from various locations on the Sandoval Zinc Company property. Analysis of the collected samples indicated numerous contaminants above background concentrations with many being three or more times background concentrations. In addition to the 1996 soil samples, sample analysis from the Ebasco Services Incorporated, April 1993 (report release date) investigation and the Illinois State Water Survey/Illinois State Geological Survey investigation, (carried out from 1975 to 1982 with issuance of their final report in 1982) conducted at this site were utilized to define source area and determine soil contaminant concentrations. All of the samples utilized for source determination were taken in the upper two feet of soil, in runoff areas and areas which were used to dispose of ash and cinder wastes attributable to former site activities. According to the HRS definition of a source when referring to contaminated soil, any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from the migration of a hazardous substance is considered a source. Based on this definition the source is an area of approximately thirteen acres (566,280 square feet).

3.2 CONTAMINATED SOIL (OVERLAND ROUTE)

During sampling activities conducted on May 22 - 23, 1996, one soil sample was collected from the west bank of the pond east of the Sandoval Zinc property. Sample X105 was collected from the soil, approximately six inches above the water level of the pond. Sample analysis indicated several contaminants were above background concentrations and similar in

nature to those detected in the contaminated soil on Sandoval Zinc property. The radial nature of the sites drainage has provided the mechanism by which contaminants have migrated from the property boundaries resulting in an additional area of contaminated soil. Even though the investigations of the Sandoval Zinc Company site have determined that there is off property contamination, the full areal extent of soil contamination along the overland route has not been determined. Based on analysis of soil samples collected beyond Sandoval Zinc Company property the current area of off property contaminated soil due to overland flow/off property migration is estimated to be three acres (130,680 square feet). The purpose of the teams' sampling beyond the property boundary was to determine if runoff/contamination from on the property had affected the area just off of the property. See Tables 1 & 2 for a complete summary of the analytical results from the May 22 - 23, 1996 soil samples.

3.3 WASTE PILE (ZINC OXIDE -- ASH & WASTE PRODUCT)

The subject waste piles are located inside the buildings on the property. These piles are composed mainly of zinc oxide. The piles have been sampled during previous investigations with analytical data recorded in April 14, 1989 and April 7, 1993 reports. The piles were found to contain elevated concentrations, above remediation objectives, of aluminum, iron, lead, and zinc. Copper and nickel were also found to be above remediation objectives in one of the locations. Lead ranged from 1100 to 63,000 ppm and zinc ranged from 27,000 to 680,000 ppm. Copper and nickel found in the sample mentioned above were 71,000 ppm and 14,000 ppm respectively. No samples of these waste piles were collected during the May 22 - 23, 1996 ESI, however, see Table 4-2 in Appendix I, Volume 2 of this report for sample analysis of these piles.

The site itself could also be classified as a waste pile as byproducts of the smelting operations over the years, cinders and ash, were deposited directly on the sites ground surface. Cinders are estimated to be up to ten feet deep in some areas on-site. The practice of disposing of waste in this manner began with the opening of the plant in the late 1880's and ended in 1970 when a scrubber system was placed on the plant stack. Scrubber waste was subsequently placed into a dewatering lagoon (100 ft. x 100ft. x 4 ft.), constructed into the cinder waste pile east of the plant buildings, and allowed to dry. After dewatering, the sludge material was reprocessed or sold to fertilizer companies. The lagoon is no longer visible and the specific location is not known.

4.0 MIGRATION PATHWAYS

4.1 GROUNDWATER

According to the Illinois State Geological Survey and the Illinois State Water Survey the Sandoval Zinc site is located in the south central portion of the Illinois Basin. This is a large Paleozoic spoon shaped sedimentary basin. Surficial deposits overlying the bedrock strata of the basin are unconsolidated glacial tills, outwash, and drift. The thickness and composition of these deposits vary across the state, typically thinning to the south.

The glacial deposits of south central Illinois are composed primarily of till, poorly sorted clay, silt, sand and pebbles laid down during the four major Pleistocene advances of the glaciers (Nebraskan, Kansan, Illinoisan and Wisconsinan advances). Soil formation occurred during the period of time between the glacial advances known as interglacial periods. The Nebraskan glacial advance effected a small portion of western Illinois and was either never deposited in south central Illinois or was subsequently eroded. In areas where deposits did occur it is common to find Afton Soil formed on top of the deposits. The Kansan advance effected nearly two-thirds of Illinois. Sediments deposited during this advance in south central Illinois belong to the Banner Formation Till. The Lierle Clay Member of the Banner Formation overlies the till of this member. The Yarmouth Soil was developed directly on top of the Kansan glacial deposits. The Illinoisan stage was marked by three major advances which covered most of the state. The Glasford Formation Till was deposited during the first and second advances. The Vandalia Till Member of the Glasford Formation was deposited during the second advance. The Hagarstown Member of the Glasford Formation was deposited over the Glasford Till. During the Sangamonian interglacial the Berry Clay Member of the Glasford Formation was deposited.

Sangamon Soil developed directly on top of the Illinoisian deposits. There were two glacial advances during the Wisconsinan stage. Wisconsinan deposits were limited to northern Illinois, with large quantities of loess deposited over much of the rest of the state. Roxana Silt was deposited during the early to middle Wisconsinan in corresponding with the first of the two glacial advances. The Farmdale Soil was formed during an interval of soil formation between the two Wisconsinan advances. Peoria Loess was deposited as a result of reduced volume of alluvial deposits from outwash streams of late Wisconsinan glaciers.

Bedrock strata in Illinois is controlled by the Illinois Basin. Strata underlying the site range from Pre-Cambrian granites to Pennsylvania sedimentary layers. The Pre-Cambrian basement rocks in Illinois lie at depths greater than 8,000 feet below the ground surface in Marion County.

The preglacial bedrock surface in Marion County, Illinois belongs to the Pennsylvanian Bond Formation. These Pennsylvanian rocks consist predominantly of green calcareous clays and shales interbedded with thin sandstone, limestone and coal layers. The Bond Formation varies from less than 150 feet thick in eastern Illinois to over 300 feet in southeastern Illinois and is approximately 250 feet thick in much of Marion County.

The subsurface geology at the Sandoval Zinc Company site was investigated through soil borings during previous site investigations conducted by EBASCO and IEPA. The generalized stratigraphy at the site, beneath the cinder fill, consists of glacial deposits of varying thickness overlying the Pennsylvanian Bond Shale (see Appendix I). Based on the previously mentioned soil borings, the glacial deposits consisting of Peoria Loess and Roxana Silt of the Wisconsinan Stage; the Berry Clay of the Sangamonian Stage; and the Hagarstown Member and the Glasford

Till of the Illinoisan Stage were found to depths of approximately 20 feet below ground surface. The Peoria Loess is a brownish-grey clayey silt with small amounts of sand that was formed by wind deposits of fine particulate matter. The loess ranges in thickness from 6 to 12 feet throughout the Sandoval Zinc site. Below the Peoria Loess is the Roxana Silt, this is a dark brown clayey silt with approximately 30 percent sand content. The Roxana Silt is thin beneath the site ranging in thickness from 1 to 2 feet. The Berry Clay, below the Roxana Silt, is dark grey in color and is a sandy, silty clay with some small gravel. The Hagarstown Member of the Illinoisan Stage, below the Berry Clay, is a thin silty sand approximately 1 to 2 feet in thickness. At times this strata is difficult to distinguish from the underlying till. This unit is the only one which is water-bearing in the vicinity of the site. The Glasford Till, below the Hagarstown Member, consists of grey to dark grey sandy and silty till which is approximately 20 to 40 feet thick throughout the area beneath the site. Small lenses of sand, silt and clay can also be found within the till.

Previous investigations by the ISWS/ISGS determined the glacial deposits below the Glasford Till to be the Lierle Clay and the Banner Formation Till. Underlying the Banner Till, at depths of 55 to 75 feet below ground surface is the Pennsylvanian Bond Formation which is a micacious green shale. The EBASCO and IEPA borings were finished at shallower depths than those of the ISWS/ISGS study, and were also located at the edge of the site, where the artificial fill material was not encountered.

Much of the regional groundwater in Marion County, particularly in the western portion of the county, is retrieved from the unconsolidated glacial deposits that cover the Pennsylvanian bedrock. In some areas, Pennsylvanian sandstones are a source of groundwater, mostly in the

southeastern portion of the county. Where sandstone units occur, groundwater can be drawn from the top 150 to 200 feet of the units (ISGS, 1957). A pre-glacial valley in the west-central part of Marion County has thick deposits of unconsolidated sands and gravels. These deposits are a source of limited private water supplies. Most of the local water supply for the farms and residences surrounding the City of Sandoval is obtained from large diameter wells completed in the unconsolidated deposits of the Hagarstown Member. These wells which were either dug or bored, usually tap lenses or thin layers of water-bearing silty sand or gravel only a few inches thick (ISWS, 1980). The wells range in depth from 30 to 60 feet with water levels varying up to 10 feet due to seasonal precipitation and recharge rates. These wells may only produce a few hundred gallons of water per day. There is no potential for providing enough water for a municipal supply. Test holes drilled into the Pennsylvanian Bond Shale have encountered only a few thin beds of water-bearing sandstone and creviced limestone. Below depths of 100 to 150 feet beneath ground surface, water is potentially too mineralized to be used for domestic purposes. The nearest private residential well to Sandoval Zinc Company is approximately 2640 feet north-northeast. The depth of the well is not known. Within a four mile radius of the Sandoval Zinc site there are approximately 500 persons obtaining drinking water from private individual/residential groundwater wells. The City of Sandoval, with a population of approximately 1535 persons, is supplied with drinking water by the community of Centralia, which obtains source water from Crooked Creek. Crooked Creek is located just north of Centralia and 5 miles south of Sandoval.

Groundwater beneath the site and around its perimeter has been contacted at between 5 and 8 feet below ground surface. Depth of soil and groundwater contamination is based on

previous site studies completed by ISWS/ISGS, EBASCO and IEPA (see Appendix I). Inorganic analyte contamination to approximately 28 feet below ground surface was found through soil coring and groundwater well samples completed and collected by ISWS/ISGS. Similar contaminants were found in groundwater beneath the site by EBASCO and IEPA. However, groundwater monitor wells installed during the EBASCO and IEPA studies did not extend below 20 feet beneath ground surface. Based on the cinder fill covering the site to depths of 10 feet and groundwater being present at between 4 and 8 feet beneath ground surface, groundwater therefore is in contact with fill material and contaminated soil. Volatile, semi-volatile, pesticide and PCB constituents were not found in these wells. There have been no reports of complaints or indications of groundwater contamination by any private residential water well user in the area surrounding the site. However, one well north of the site which was sampled did show two constituents above drinking water standards (silver 60 ppb. and thallium 100 ppb.). Federal Drinking water Standards are 50 ppb for silver and 0.5 ppb for thallium.

No wellhead protection areas (as designated by Section 1428 of the Safe Drinking Water Act) exist near the site.

A listing of the number of persons utilizing the City of Sandoval public water system and the approximate number of individuals using private water wells in each distance category are presented in the table below.

Individuals utilizing a public water system or private water wells

Distance (mi)	Population Public	Private
On-site	0	0
0 - 1/4	28	0
1/4 - ½	377	5
½ - 1	1055	36
1 - 2	75	230
2 - 3	827	293
3 - 4	862	378

The number of people on private wells were calculated using 2.55 people per household in Marion County, as established by the U.S. Census Bureau (1990)

4.2 SURFACE WATER

Surface water drainage from the site is in a radial pattern with the two prominent paths being toward the east and west. Moisture on site has also been found to either infiltrate into the cinder fill or pool at various locations. Drainage from the site flows into one of two intermittent streams which border the site, one on the east and one on the west. Due to this situation there are two Probable Points of Entry (PPE) to surface water from the site (Figure 5). The Probable Point of Entry into a perennial waterway for the eastern drainage way is located 2000 feet south-southeast of the site at the confluence of the drainage way and Prairie Creek. According to National Wetland Inventory Maps (Figure 6), Palustrine Emergent, seasonally flooded wetlands exist along both sides of the entire distance of the intermittent drainage way from the Sandoval Zinc site to Prairie Creek. This type of wetland, and a palustrine scrub-shrub wetland then continues southwesterly along both banks of Prairie Creek for another 3700 feet. The Probable Point of Entry into a perennial waterway for the western drainage way is located 3500 feet south-southwest of the site at the confluence of the drainage way and Prairie Creek. According to

National Wetland Inventory Maps, Palustrine Emergent, Seasonally Flooded wetlands exist along this route with Riverine, Intermittent, Streambed, Semipermanently Flooded wetlands located in the drainage way 400 feet prior to the confluence of the drainage way and Prairie Creek. At the point of confluence (also the western PPE) and continuing downstream, Prairie Creek wetlands are listed as Riverine, Lower Perennial, Unconsolidated Bottom.

The 15-mile target distance limit for the eastern drainage way extends from the PPE at Prairie Creek approximately thirteen and one half miles southwest to Lost Creek, ending one and one half miles southwest of the confluence of Prairie Creek and Lost Creek.

The 15-mile target distance limit for the western drainage way extends from the PPE at Prairie Creek approximately twelve and one half miles southwest to Lost Creek, ending two and one half miles southwest of the confluence of Prairie Creek and Lost Creek.

The closest permanent water body to the site is a small pond located on Sandoval Zinc property about fifty feet east of the eastern drainage way. This pond is also the closest wetland as indicated on the National Wetlands Inventory maps. Additional wetland type plants were noted. during the site reconnaissance and sampling event, in the drainage ditches north of the railroad tracks north of the Sandoval Zinc plant and in the proposed City park area, also north of the railroad tracks.

National Wetlands Inventory Maps of the area also indicate that numerous wetlands are located within a four mile radius from the site.

Seven sediment samples were collected from six locations in the two site drainage ways and Prairie Creek. Analytical results of the May 22 - 23, 1997 sampling event have indicated that among other heavy metal constituents, lead and zinc were found at 3370 ppm and 39,000

ppm respectively in the western drainage way at sample point X206. Lead and zinc found in the eastern drainage way were found at concentrations of 3300 ppm and 6520 ppm respectively at sample point X201 and X202 (Duplicate of X201) (Figures 7 & 8). Downstream, at the confluence of each drainage way with Prairie Creek, concentrations of these and other constituents were found to be significantly reduced. Concentrations of lead and zinc at the western confluence were noted to be 339 ppm and 2710 ppm respectively. Lead and zinc at the eastern confluence was found at concentrations of 50 ppm and 261 ppm respectively. Based on the Provincial Sediment Quality Guidelines for Ontario, Canada (1992), the concentrations of constituents in the western drainage way, both, near the site and downstream at the confluence of Prairie Creek, are above the listed Severe Effect Level. This level indicates the level at which pronounced disturbance of the sediment-dwelling community can be expected. This is the sediment concentration of a compound that would be detrimental to the majority of benthic species. The concentrations of constituents in the eastern drainage way, near the site, were found to be mostly above the Severe Effect Level with arsenic and cadmium being between the Lowest Effect Level and the Severe Effect Level. Downstream at the confluence of Prairie Creek all constituents are below the listed Severe Effect Level. Arsenic and nickel are below the Lowest Effect Level, all others are between the two effect levels.

4.3 SOIL EXPOSURE PATHWAY

As mentioned previously, the facility is no longer an active business. A fence surrounding the site is present, having been constructed in 1990 when the IEPA ordered the site closed. The fencing is continually vandalized by trespassers. There are numerous signs of

recreational use on the property. With the fencing torn down, tire tracks found on-site indicate that trespassers riding dirt bikes, three and four wheel recreational vehicles and pickup trucks frequent the site and in the buildings. There has also been sporadic incidences of other vandalism. Various fires have been started by trespassers and a some of the site buildings have been ransacked a number of times. Access to the site can be accomplished along any side of the site through any hole in the fence.

The area immediately surrounding the Sandoval Zinc site is considered to be a rural setting. There are no residences living on or within 200 feet of the site. Urban residential areas are located northwest, west and southwest of the plant site. Scattered rural residences are located throughout the four mile radius from the site. An estimated 1500 people live within one mile of the site. The nearest resident is approximately 1400 feet to the northwest of the facility. There are no schools or day care facilities within 200 feet of documented soil contamination. The area to the north of Sandoval Zinc Company is currently open field, but has been proposed as a possible location of a city park.

Due to Sandoval Zinc Company being in operation for many years the potential exists that through the course of operations contaminants such as lead may have been transported by various means throughout the City of Sandoval. Because blood lead levels in children are a major concern in many communities, the Marion County Health Department was requested by the Illinois EPA to conduct a lead screening at the Children's Activity Center in Sandoval. A total of 33 children were tested. None of the children tested exhibited a lead level of 10 or above. Only 1 tested at 6 and 1 tested at 7 (see Appendix G). Also included in Appendix G is a Mat 4, 1994 Health Assessment of Sandoval Zinc Co. Conducted by the Illinois Dept. of Public

Health.

Nearby population within one-mile of the site

Distance (mi)	Population
On-site	0
0 - 1/4	28
1/4 - ½	382
½ - 1	1091

The number of people was calculated using 2.55 people per household in Marion County, as established by the U.S Census Bureau (1990)

Soil samples collected during the expanded site investigation were obtained from twenty eight sample locations (twenty-nine samples, one being a duplicate) (Figures 7 & 8). Samples X101 - X105 were collected on the Sandoval Zinc Company property. Samples X106 - X129 were collected within the City of Sandoval and surrounding area. Samples X109, X111 - X114, and X128/X129 were collected from the outlying area near Sandoval. All soil samples were collected from between ground surface and a maximum depth of six inches beneath ground surface. Because heavy metal/inorganic contamination is the primary concern at this site and throughout the community, all off-site samples were analyzed for inorganics only. On-site samples were analyzed for the full Target Compound List (TCL). A full TCL analysis was completed on-site to compare current analytical data with previously collected data. Comparison of the data indicate that quantitatively and qualitatively site contamination remains the same. Lab analysis of on-site soils has revealed concentrations of lead in a range from 603 ppm to 22,300 ppm and zinc levels from 3360 ppm to 339,000 ppm. Removal Action Levels for lead

and zinc are 1000 ppm and 160,000 ppm respectively. Analysis of samples collected from residential areas within the City of Sandoval revealed concentrations of, among other constituents, lead in a range from 27 ppm to 2840 ppm and zinc in a range from 112 ppm to 5200 ppm. Analysis of samples collected in the surrounding areas, outside of the city limits, of Sandoval, indicate lead concentrations in a range of 85 ppm to 1150 ppm and zinc concentrations in a range from 442 ppm to 12,500 ppm.

4.4 AIR ROUTE

During the May 22 -23, 1996 ESI, there were no formal air samples collected. Past aerial photography of the site (Appendix C) has shown smoke plumes being emitted from the stacks on the former retort furnaces and from the process building after use of the retorts were discontinued. Assuming the plant was typical of secondary zinc smelters using retort processing, metal rich air emissions potentially reached a range from 50 to 100 tons annually (IEPA, 1991 Konzelmann). Prior to the installation of a stack scrubber on the smelter furnace, wind blown ash, rich in zinc and other heavy metals, was deposited on the plant site, on surrounding farm ground and in the City of Sandoval. In addition to ash from the smelter furnaces other wind-borne emissions may have been generated by plant waste handling procedures such as open storage of cinders and ash as well as bulk storage of zinc oxide in open bins inside plant buildings. The potential for contaminated particulates to be carried off-site remains high as no mitigative measures have been implemented to avoid this. Even though the facility has been inactive since 1985 and a fence constructed around the estimated extent of the cinder fill, the property has been used by area residents as a venue for their two, three and four recreational

vehicles. This is evidenced by their continued effort to tear down the fence and the numerous tire tracks throughout the site as well as in the buildings on-site. Inhalation and ingestion are of concern due to these activities. An estimated 5,100 people live within a four-mile radius of the site. No schools or day care facilities are located within 200 feet of observed soil contamination.

Individuals potentially exposed to air-borne contaminants

Distance (mi)	Population
On-site	0
0 - 1/4	28
1/4 - ½	382
½ - 1	1091
1 - 2	305
2 - 3	1120
3 - 4	1240

The number of people were calculated using 2.55 people per household in Marion County, as established by the U.S. Census Bureau (1990)

5.0 ADDITIONAL RISK BASED OBJECTIVES

This section discusses additional screening objectives used to evaluate the Sandoval Zinc Company site. These objectives have not been used to assess the site for Hazard Ranking System (HRS) purposes.

5.1 TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES (TACO)

The Illinois EPA's TACO guidance document (35 IL Adm. Code Part 742), can be used to develop site specific remediation objectives for sites being addressed under the Illinois Site Remediation Program. This document discusses key elements required to develop risk-based remediation objectives, how background values may be used, and provides guidance through three tiers of the risk-based approach. The IEPA uses this guidance, and the groundwater standards established in 36 IL Adm. Code 620, to determine soil and groundwater remediation objectives.

Soil and sediment contaminants found during the May 22 & 23, 1996 CERCLA investigation have been compared to the soil and sediment corrective action objectives established for residential properties, with ingestion, inhalation, and migration to groundwater pathways each evaluated. Tier 1 consists of "look-up" tables which consider limited site-specific information and are based on simple numeric models. All five of the on-site sample locations contained at least one constituent that exceeded the TACO Tier 1 soil remediation objective for that contaminant. Six of the twenty-four off-site residential yard sample points were found to contain at least one constituent exceeding TACO remediation objectives. Four of the seven off-site sediment samples were also found to contain at least one constituent each

exceeding TACO remediation objectives (Reference Tables 3 & 4).

To consider TACO migration to groundwater route values (specifically the pH Specific Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route), remediation objectives are based on pH values for each individual sample, therefore varying the specific corrective action objective value for each sample. The laboratory analyzing the Sandoval Zinc samples did not determine the pH values for the inorganic fraction of the soil samples, therefore, values for Sandoval Zinc could not be determined. Tables 1 & 2 illustrate all contaminants and their respective concentrations detected in soil and sediment samples during the May 1996 ESI field activities. Tables 3 & 4 illustrate all constituents with their corresponding concentrations which are at least three times background levels. Tables 3 & 4 also indicates those constituents which exceed corresponding TACO soil and sediment remediation objectives for residential properties.

Groundwater beneath the site was not sampled during the May 1996 ESI. It was, however, sampled during previous site investigations conducted by ISWS/ISGS, IEPA, and EBASCO at various times from 1974 to 1990. Groundwater beneath the site has been classified as Class II groundwater due to water being detected at less than ten feet below ground surface.

Sample results from one residential drinking water well north of the site (collected in June 1990, presented in the EBASCO report located in IEPA site files) revealed the presence of five inorganic constituents with silver and thallium exceeding Federal Drinking Water Standards. The concentrations of these constituents also exceeded the TACO Tier 1 Groundwater Remediation Objectives for Class II Groundwater.

Analytical results of five on-site groundwater monitor well samples collected during the

same 1990 sampling event revealed heavy metal constituents in four of the samples. Three constituents exceeded Federal Drinking water Standards in one of the samples and one constituent exceeded standards in three other samples. Silver exceeded the TACO Tier 1 Groundwater Remediation Objectives for Class II Groundwater in three of the samples.

6.0 FIGURES AND TABLES

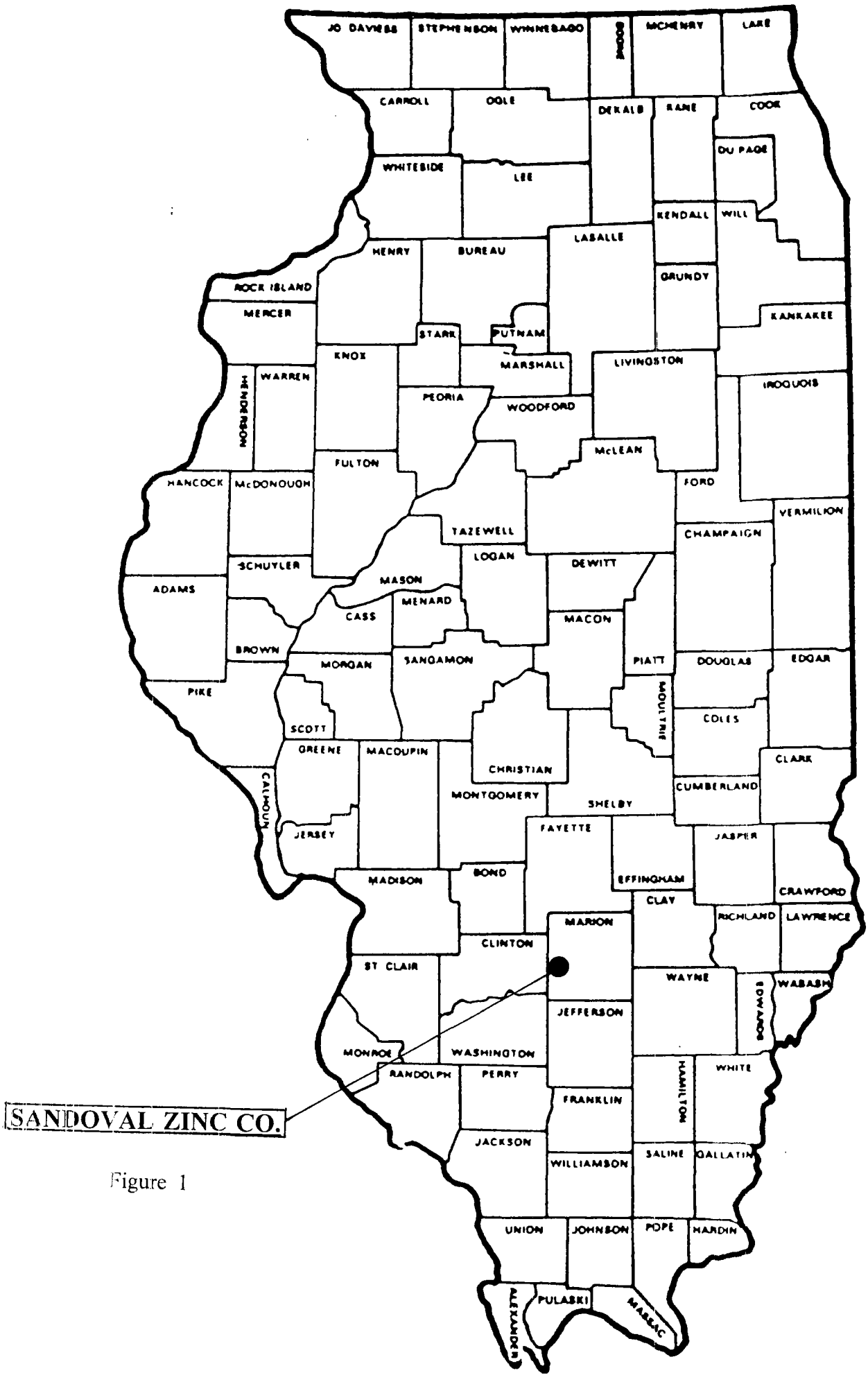

JO DAVIESS
STEPHENSON
WINNEBAGO
BOONE
MCHENRY
LAKE
CARROLL
OGLE
DEKALB
KANE
COOK
DU PAGE
WHITESIDE
LEE
KENDALL
WILL
LASALLE
HENRY
BUREAU
GRUNDY
ROCK ISLAND
MERCER
KANKAKEE
STARK
PUTNAM
KNOX
MARSHALL
LIVINGSTON
HENDERSON
WARREN
PEORIA
WOODFORD
IROQUOIS
FULTON
McLEAN
HANCOCK
McDONOUGH
FORD
VERMILION
TAZEWELL
CHAMPAIGN
SCHUYLER
LOGAN
DEWITT
MASON
ADAMS
CASS
MENARD
MACON
BROWN
MORGAN
SANGAMON
PIATT
DOUGLAS
EDGAR
PIKE
MOULTRIE
SCOTT
COLES
GREENE
MACOUPIN
CHRISTIAN
CLARK
CALHOUN
MONTGOMERY
SHELBY
CUMBERLAND
JERSEY
FAYETTE
JASPER
MADISON
BOND
EFFINGHAM
CRAWFORD
CLAY
MARION
RICHLAND
LAWRENCE
CLINTON
ST CLAIR
WAYNE
WABASH
EDWARDS
JEFFERSON
MONROE
WASHINGTON
RANDOLPH
PERRY
HAMILTON
WHITE
FRANKLIN
JACKSON
SALINE
GALLATIN
WILLIAMSON
UNION
JOHNSON
POPE
HARDIN
ALEXANDER
PULASKI
MASSAC
SANDOVAL ZINC CO.

Figure 1

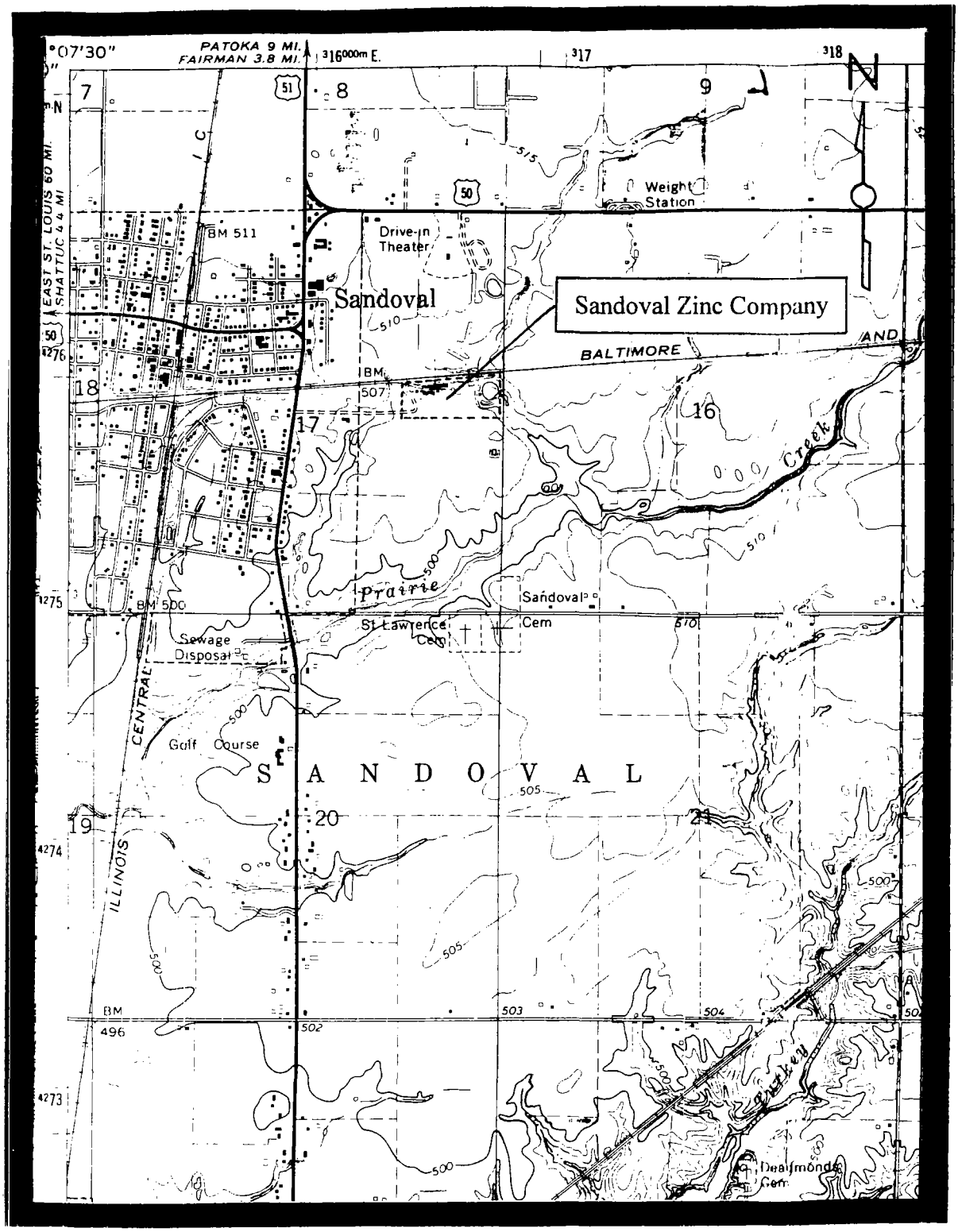


Figure 2

Topographic Map

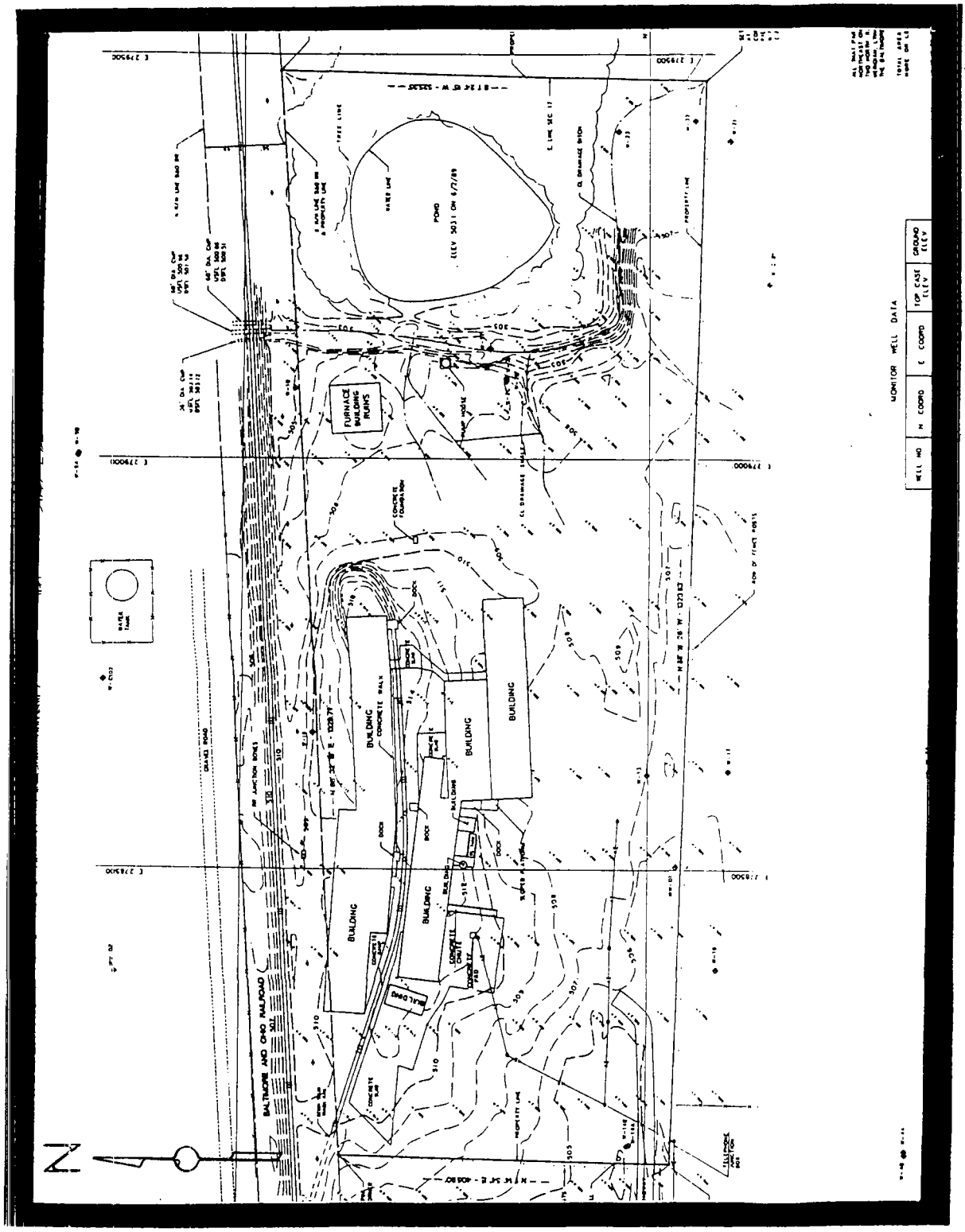


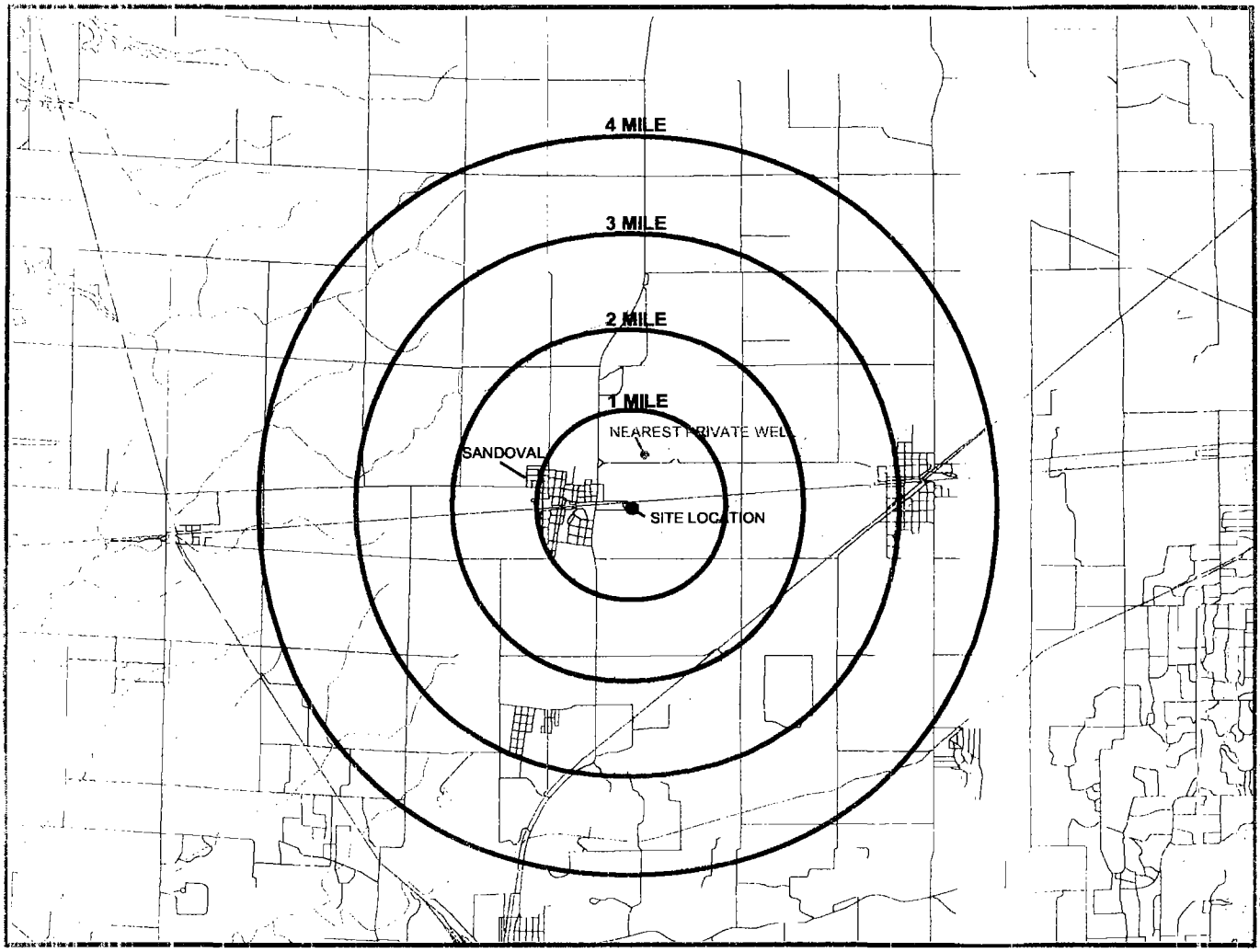
Figure 3

Site Map

Appendix A

4-Mile Radius Map

FOUR MILE RADIUS MAP



0 1 2 MILES

ROAD

RAIL ROAD

STREAM

N

W E

S

Appendix B

Section III of 4(q) Notice

Notice Failure by the Parties to undertake these actions may result in sanctions including, but not limited to, the sanctions described in Section XIX of this Notice.

II. OBJECTIVES

The objectives of the Agency in issuing this notice are: 1) to provide notice to the Parties of a release or substantial threat of release of hazardous substances or pesticides at or attributable to the Site. 2) to identify appropriate actions for response to the release or the substantial threat of a release of hazardous substances or pesticides at or attributable to the Site; and 3) to provide an opportunity for the Parties to perform such response actions. All activities conducted pursuant to this Notice are subject to approval by the Agency and shall be substantially consistent with the Illinois Hazardous Substances Pollution Contingency Plan, 35 Ill. Adm. Code 750, as amended.

III. FINDINGS OF FACT

The following constitutes the facts upon which this Notice is based:

A The Site includes all areas where contaminants have come to be located The Site consists of 14.157 acres of property located off of U.S. Route 51, southeast of Sandoval, on Smelter Road, in the SE 1/4 of the NE 1/4, Section 17, Township 2 North, Range 1 East, in Marion County, Illinois.

B The current owner of the Site by warranty deed recorded October 25, 1989 is WHITE BROTHERS SALVAGE & RECYCLING, INC. There are no current operations on the site

C The current owner received title from ALBERT F. HAAS per warranty deed referred to above. ALBERT F. HAAS received title per corporation warranty deed from SANDOVAL ZINC CO. executed on March 14, 1988.

D SANDOVAL ZINC CO. was the operator and owner of the Site during a period when releases took place from the Site.

E BETHLEHEM STEEL CORPORATION arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

F COMMERCIAL METALS arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

G EAGLE-PICHER INDUSTRIES, INC. arranged for the transportation, storage, disposal or

treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

H EMPIRE IRON & STEEL arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

I FLINT STEEL CORPORATION arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

J GEROX, INC. arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred

K H.K. PORTER CO., INC. arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

L LACLEDE STEEL arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

M LURIA BROS. arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred

N KEYSTONE STEEL & WIRE CO. (a division of KEYSTONE CONSOLIDATED INDUSTRIES, INC.) arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

O NORTHWESTERN STEEL & WIRE arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

P PENN-DIXIE STEEL CORP. arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

Q ST. JOE MINERALS CORPORATION arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

R YOUNGSTOWN SHEET & TUBE arranged for the transportation, storage, disposal or treatment of hazardous substances to or at the Site, from which a release of such hazardous substances occurred.

S. The Site was operated by SANDOVAL ZINC CO. as a secondary zinc smelter since at least 1940. SANDOVAL ZINC CO. continued to operate the Site until it closed in 1985. Compounds fed into the kilns were pure zinc, zinc oxide, zinc chloride, possibly aluminum chloride, and other trace metals. SANDOVAL ZINC CO. accepted materials containing hazardous substances, such as those at the Site, from third parties as a regular part of its business.

T A Record of Decision was signed by the Director of the Illinois Environmental Protection Agency on September 24, 1986 for a Remedial Investigation/Feasibility Study to be conducted at the site.

U The site is in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). The Preliminary Assessment was completed on December 19, 1986 with a high priority rating.

V The Agency undertook removal actions related to a spill of fuel oil from an above ground storage tank at the Site. A Seal Order was signed by the Director of the Illinois Environmental Protection Agency on April 24, 1991. The Agency installed a fence to limit access to the site. Vandals have repeatedly torn down the fence.

W A draft Feasibility Study was issued in April of 1993. The Screening Site Inspection Phase of CERCLIS was completed on September 29, 1995 with a high priority rating.

X From 1975 through 1982, the Illinois State Water Survey (ISWS) and the Illinois State Geological Survey (ISGS) carried out geologic and groundwater studies at the Site. According to results of these studies, the processing waste covering the Site is rich in zinc, lead, copper, cadmium, and aluminum. One sample of waste material at the site was 76 times the Extraction Procedure (EP) Toxicity Standard for lead.

Y When the Site was abandoned in 1985, the above ground storage tank (railroad tank car) contained four feet of #5 diesel fuel oil. In 1991, a valve failed and the oil leaked out. The Agency collected 8,600 gallons of oil and had it incinerated. Also recovered was 500 cubic yards (540 tons) of impacted soil. This soil is presently being stored on a plastic liner inside one of the buildings. There are also nine full drums of oil/sludge/water rinsate and one additional drum full of personal protective equipment (PPE) from the cleanup of the spill being stored onsite.

Z In April 1993, Ebasco Environmental Services produced a draft Feasibility Study, which

reported that the developed portion of the site is comprised of two large abandoned buildings, an abandoned railroad tank car (also referred to as the above ground storage tank), old furnace building ruins, and a pond to the east. The site is covered with metal rich cinder fill, 1-28 feet thick. This fill contains highly elevated levels of cadmium, copper, lead, nickel, silver, and zinc.

AA The Draft Feasibility Study also stated that there are approximately fifty cubic yards (135 tons) of waste product/ash stored inside the buildings. Some of the material is zinc oxide This material is found in uncovered piles and scattered over the floor. This material is considered to be characteristically hazardous. Lead was found to be greater than 10,000 milligrams/kilogram (mg/kg). Zinc was found to be greater than 200,000 mg/kg. Elevated levels of chromium and nickel were found in random sampling at the site

IV. CONCLUSIONS OF LAW

A. The Site described in Section III(A) of this Notice is a "facility" as defined in Section 22.2(h)(1) of the Act, 415 ILCS 5/22.2(h)(1).

B. Each of the Parties is a "person" as defined in Section 3.26 of the Act, 415 ILCS 5/3.26

C. Materials, wastes and constituents thereof at the Site are "hazardous substances" as defined in Section 3.14 of the Act, 415 ILCS 5/3.14, or "pesticides" as defined in Section 3.71 of the Act, 415 ILCS 5/3.71.

D The past, present or potential migration of hazardous substances or pesticides from the Site constitutes an actual or substantial threat of "release" as defined in Section 3.33 of the Act, 415 ILCS 5/3.33.

E The Parties are persons who may be liable for all costs of removal or remedial action incurred by the State of Illinois pursuant to Section 22.2(f) of the Act, 415 ILCS 5/22.2(f), for a release or substantial threat of a release of a hazardous substance or pesticide

V. DETERMINATION

Based on the Findings of Fact and Conclusions of Law set forth above, the Agency has determined that the response actions identified in this Notice are appropriate to mitigate the release or substantial threat of a release of hazardous substances or pesticides at or from the Site.

Appendix C

Aerial Photography 1938 - 1980

Appendix D

Target Compound List

TARGET COMPOUND LIST

Volatile Target Compounds

Chloromethane	1,2-Dichloropropane
Bromomethane	cis-1,3-Dichloropropene
Vinyl Chlorde	Trichloroethene
Chloroethane	Dibromochloromethane
Methylene Chloride	1,1,2-Trichloroethane
Acetone	Benzene
Carbon Disulfide	trans-1,3-Dichloropropene
1,1-Dichloroethene	Bromoform
1,1-Dichloroethane	4-Methyl-2-pentanone
1,2-Dichloroehtene (total)	2-Hexanone
Chloroform	Tetrachloroethene
1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
2-Butanone	Toluene
1,1,1-Trichloroethane	Chlorobenzene
Carbon Tetrachloride	Ethylbenzene
Vinyl Acetate	Styrene
Bromodichloromethane	Xylenes (total)

Base/Neutral Target Compounds

Hexachloroethane	2,4-Dinitrotoluene
bis(2-Chloroethyl) Ether	Diethylphthalate
Benzyl Alcohol	N-Nitrosodiphenylamine
bis (2-Chloroisopropyl) Ether	Hexachlorobenzene
N-Nitroso-Di-n-Propylamine	Phenanthrene
Nitrobenzene	4-Bromophenyl-phenylether
Hexachlorobutadiene	Anthracene

2-Methylnaphthalene	Di-n-Butylphthalate
1,2,4-Trichlorobenzene	Fluoranthene
Isophorone	Pyrene
Naphthalene	Butylbenzylphthalate
4-Chloroaniline	bis(2-Ethylhexyl)Phthalate
bis(2-chloroethoxy)Methane	Chrysene
Hexachlorocyclopentadiene	Benzo(a)Anthracene
2-Chloronaphthalene	3-3'-Dichlorobenzidene
2-Nitroaniline	Di-n-Octyl Phthalate
Acenaphthylene	Benzo(b)Fluoranthene
3-Nitroaniline	Benzo(k)Fluoranthene
Acenaphthene	Benzo(a)Pyrene
Dibenzofuran	Ideno(1,2,3-cd)Pyrene
Dimethy Phthalate	Dibenz(a,h)Anthracene
2,6-Dinitrotoluene	Benzo(g,h,i)Perylene
Fluorene	1,2-Dichlorobenzene
4-Nitroaniline	1,3-Dichlorobenzene
4-Chlorophenyl-phenylether	1,4-Dichlorobenzene

Acid Target Compounds

Benzoic Acic	2,4,6-Trichlorophenol
Phenol	2,4,5-Trichlorophenol
2-Chlorophenol	4-Chloro-3-methylphenol
2-Nitrophenol	2,4-Dinitrophenol
2-Methylphenol	2-Methyl-4,6-dinitrophenol
2,4-Dimethylphenol	Pentachlorophenol
4-Methylphenol	4-Nitrophenol
2,4-Dichlorophenol	

List of PNA's from Target Compound List

Naphthalene

2-Methylnaphthalene

2-Chloronaphthalene

Acenaphthylene

Acenaphthene

Fluorene

Phenanthrene

Anthracene

Fluoranthene

Pyrene

Benzo(a)anthracene

Chrysene

Benzo(b)fluoranthene

Benzo(k)fluoranthene

Benzo(a)pyrene

Indeno(1,2,3-cd)pyrene

Dibenz(a,h)anthracene

Benzo(g,h,i)perylene

Appendix E

Illinois EPA Sample Photographs

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 22/96
TIME:	1000
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 1
Sample :	X101
Direction:	North
COMMENTS:	
Sample of Cinder Waste	

DATE:	May 22/96
TIME:	1015
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 2
SAMPLE #	X102
Direction:	East
Comments:	
Sample of Cinder Waste	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 22/96
TIME:	1045
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 3
Sample :	X103
Direction:	North/Northeast
COMMENTS:	
Sample of Cinder Waste near	
old Retort Furnace	

DATE:	May 22/96
TIME:	1100
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 4
SAMPLE #	X104
Direction:	North/Northeast
Comments:	
Sample of Cinder Waste	

SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

DATE:	May 22/96
TIME:	1300
PHOTO by:	Ted Prescott
Roll / Photo # :	Photo 5
Sample :	X105
Direction:	East
COMMENTS:	

DATE:	May 22/96
TIME:	1600
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 6
SAMPLE #	X106
Direction:	North
Comments:	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 22/96
TIME:	1600
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 7
Sample :	X106
Direction:	East
COMMENTS:	

DATE:	May 22/96
TIME:	11:55 AM
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 8
SAMPLE #	X201 & X202
Direction:	Southeast
Comments:	
Sediment Sample in East	
Drainageway North of Site	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

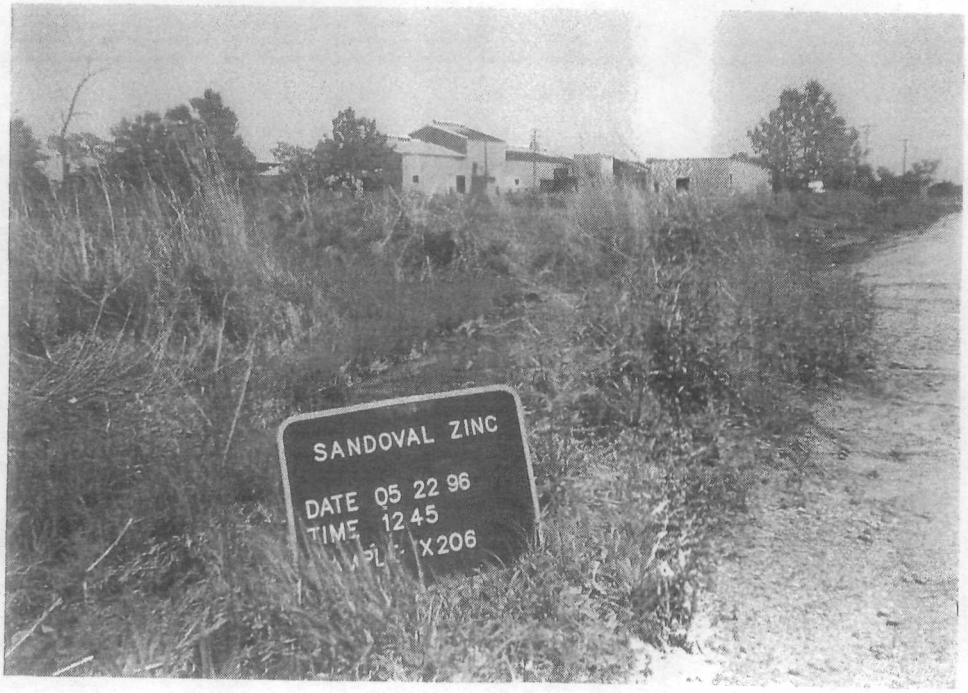
DATE:	May 22/96
TIME:	11:30 AM
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 9
Sample :	X203
Direction:	Northwest
COMMENTS:	
Sediment Sample in East Drainageway	
Southeast of Site	

DATE:	May 22/96
TIME:	1425
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 10
SAMPLE #	X204
Direction:	Northwest
Comments:	
Sediment Sample at Confluence of	
East drainageway & Prairie Creek	
South of site	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 22/96
TIME:	1315
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 11
Sample :	X205
Direction:	Southeast
COMMENTS:	
Sediment Sample in West	
Drainageway Northeast of Site	

DATE:	May 22/96
TIME:	1245
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 12
SAMPLE #	X206
Direction:	East/Northeast
Comments:	
Sediment Sample in Eastern	
Drainageway west of site	



SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 22/96
TIME:	1415
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 13
Sample :	X207
Direction:	Southeast
COMMENTS:	
Sediment Sample at Confluence of	
Western Drainageway & Prairie Creek	
south/southwest of site	

DATE:	May 22/96
TIME:	1610
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 14
SAMPLE #	X107
Direction:	Northwest
Comments:	
Southwest Corner of Cedar & Perry	

SITE NAME: Sandoval Zinc	
ILD 053980454	COUNTY: Marion

DATE:	May 22/96
TIME:	1610
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 15
Sample :	X108
Direction:	South
COMMENTS:	
19 Orchard Street	

DATE:	May 22/96
TIME:	1645
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 16
SAMPLE #	X109
Direction:	Southwest
Comments:	
North 0f High School &	
East of Old Running Track	

SITE NAME:	Sandoval Zinc		
ILD 053980545		COUNTY:	Marion

DATE:	May 22/96
TIME:	1710
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 17
Sample :	X110
Direction:	Southwest
COMMENTS:	
West of Orange St. & East of	
Day Care	

DATE:	May 23/96
TIME:	0845
PHOTO by:	Ted Prescott
Roll / Photo #:	Photo 18
SAMPLE #	X111
Direction:	Southwest
Comments:	

SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

DATE:	May 23/96
TIME:	0900
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 19
Sample :	X112
Direction:	Southwest
COMMENTS:	
Gore Residence	

DATE:	May 23/96
TIME:	0920
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 20
SAMPLE #	X113
Direction:	South
Comments:	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 23/96
TIME:	0950
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 21
Sample :	X115
Direction:	West
COMMENTS:	
4162 Rt 51	

DATE:	May 23/96
TIME:	1015
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 22
SAMPLE #	X115
Direction:	East
COMMENTS:	
Just South of the Evergreen Pool	
& Spa Center	

SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

DATE:	May 23/96
TIME:	1040
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 23
Sample :	X116
Direction:	Northwest
COMMENTS:	
503 E. Scott	

DATE:	May 23/06
TIME:	1050
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 24
SAMPLE #	X117
Direction:	Northeast
Comments:	
111 E. Scott	

SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

DATE:	May 23/96
TIME:	1100
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 25
Sample :	X118
Direction:	Northwest
COMMENTS:	
North end of Main St. at	
William's Residence	

DATE:	May 23/96
TIME:	1125
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 26
SAMPLE #	X120
Direction:	South
Comments:	
Southwest Corner of Clay	
& Virginia	

SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

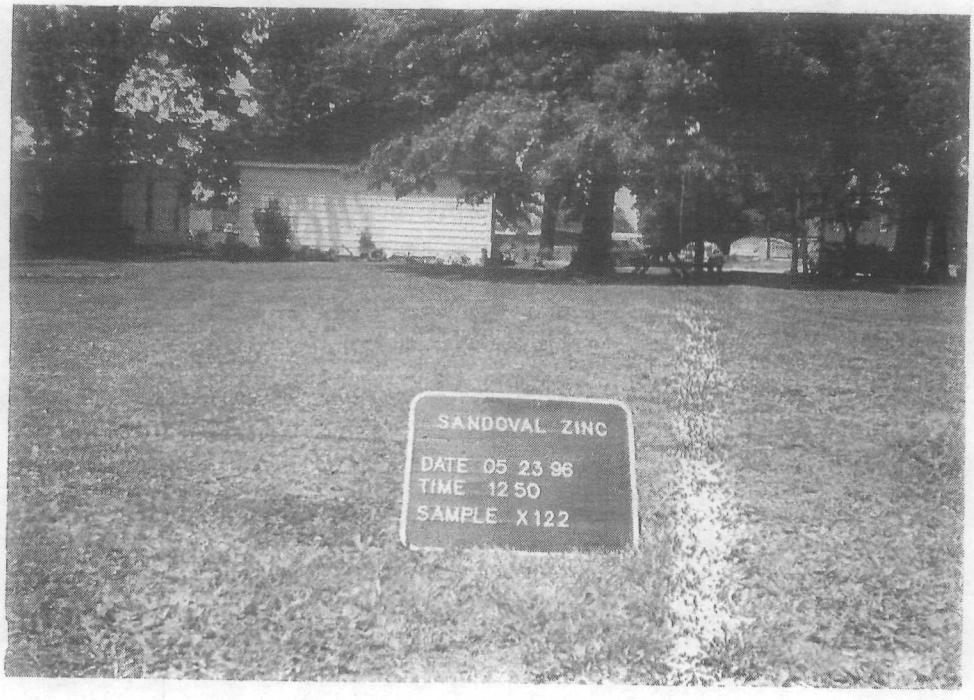
DATE:	May 23/96
TIME:	1125
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 27
Sample :	X120
Direction:	South
COMMENTS:	
Southwest Corner of Clay	
& Virginia	

DATE:	May 23/96
TIME:	1120
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 28
SAMPLE #	X119
Direction:	North
Comments:	
West of Pine Street &	
Just North of Rt. 51	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 23/96
TIME:	1220
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 29
Sample :	X121
Direction:	Southwest
COMMENTS:	
114 S. Main	

DATE:	May 23/96
TIME:	1250
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 30
SAMPLE #	X122
Direction:	Northwest
Comments:	
Northwest of Pearl St in Alley	



SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

DATE:	May 23/96
TIME:	1250
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 31
Sample :	X123
Direction:	Southeast
COMMENTS:	
At Southeast Corner of	
Arizona & Maple	

DATE:	May 23/96
TIME:	1315
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 32
SAMPLE #	X124
Direction:	Northeast
Comments:	
At East end of Backyard of	
Residence East of Rt 51 &	
North of Wyoming Ave.	

SITE NAME: Sandoval Zinc

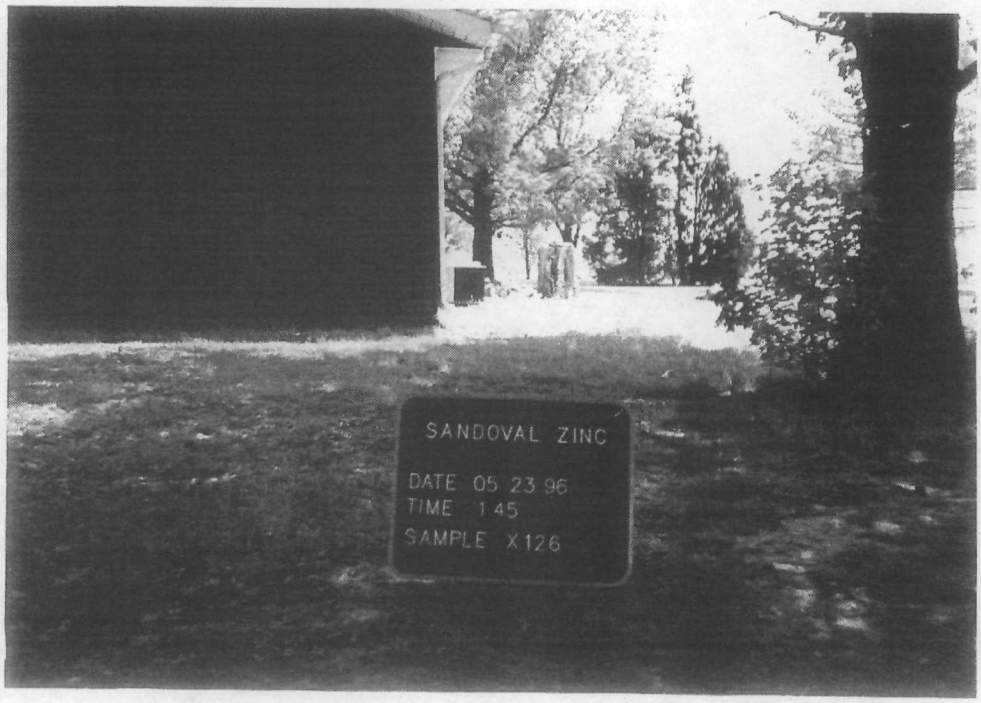
ILD 053980454 **COUNTY:** Marion

DATE:	May 23/96
TIME:	1315
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 33
Sample :	X124
Direction:	West
COMMENTS:	
Same as Photo 32	

DATE:	May 23/96
TIME:	1330
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 34
SAMPLE #	X125
Direction:	West/Southwest
Comments:	
2nd Residence North of Texas Ave.	
East of Maple	

SITE NAME:	Sandoval Zinc	
ILD 053980454	COUNTY:	Marion

DATE:	May 23/96
TIME:	1345
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 35
Sample :	X126
Direction:	South
COMMENTS:	
20 feet South of the Corner of	
Nevada Ave. & Main Street	



DATE:	May 23/96
TIME:	1400
PHOTO by:	Ken Corkill
Roll / Photo #:	Photo 36
SAMPLE #	X127
Direction:	East
Comments:	
West Edge of Ruppel Property &	
South of Nevada Ave.	

SITE NAME:	Sandoval Zinc
ILD 053980454	COUNTY: Marion

DATE:	May 23/96
TIME:	1415
PHOTO by:	Ken Corkill
Roll / Photo # :	Photo 37
Sample :	X128 & X129
Direction:	Northwest
COMMENTS:	
877 Cemetary Road	

DATE:	
TIME:	
PHOTO by:	
Roll / Photo #:	
SAMPLE #	
Direction:	
Comments:	

Appendix F

Sanborn Maps of Sandoval Zinc, 1912 & 1929

SEP 7 1912

6091
(4 SHEETS)

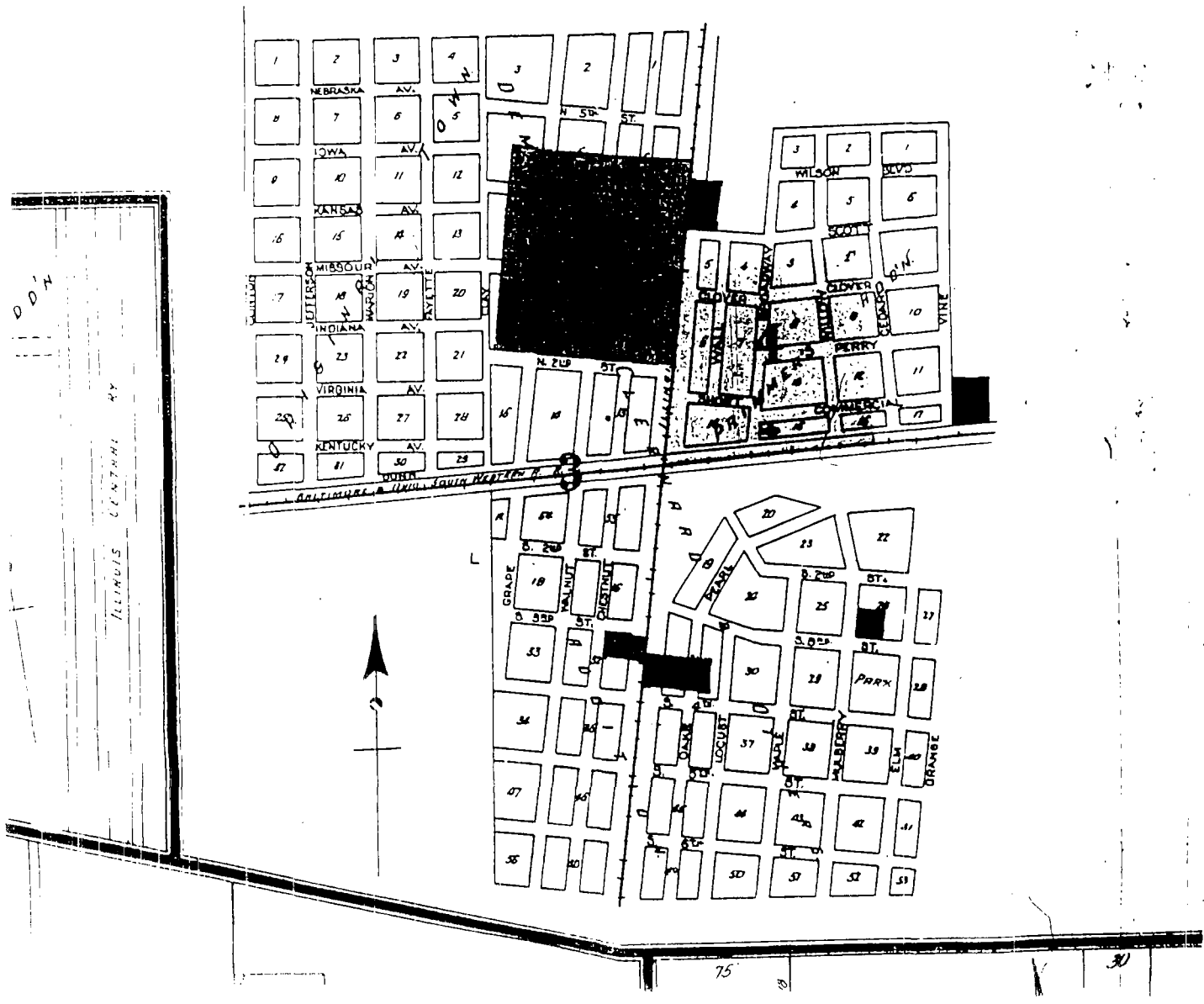
1

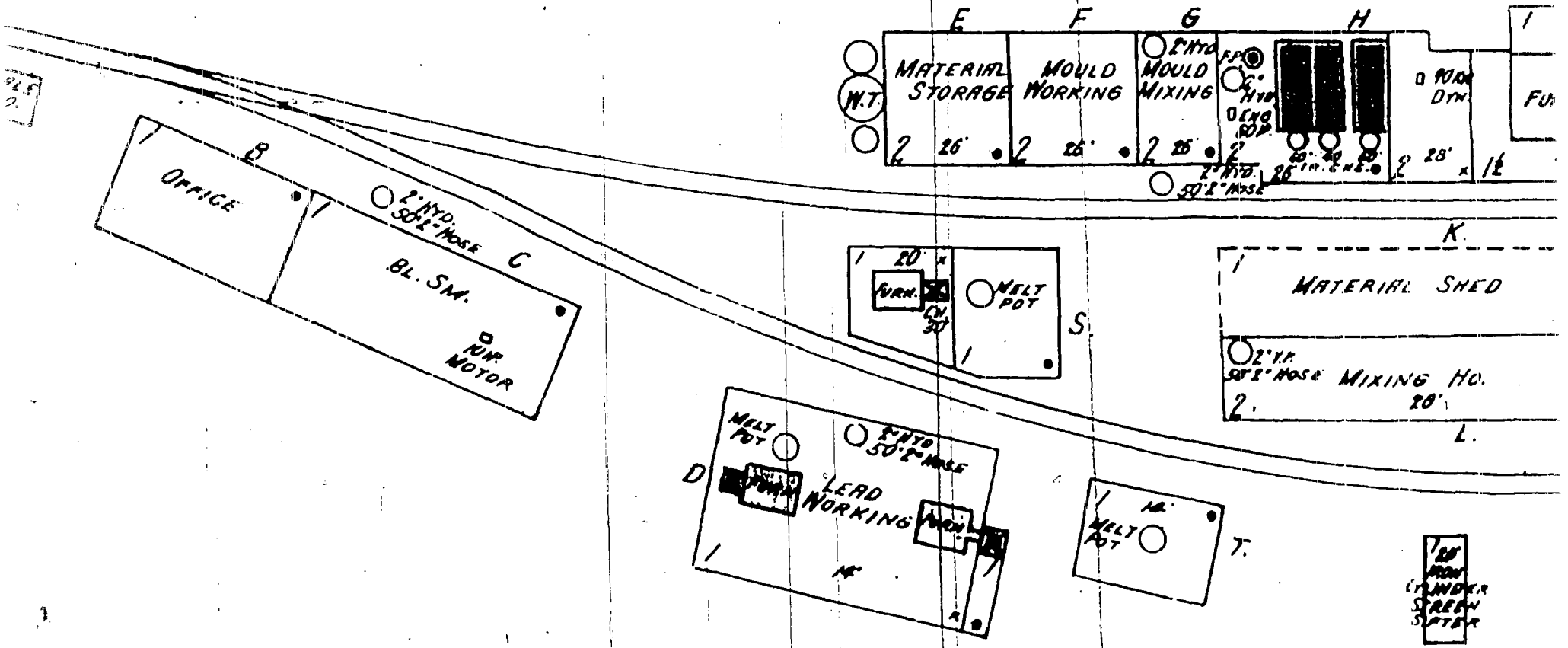
WATER FACILITIES:
Public & private wells & cisterns.

FIRE DEPT:
Volunteer, 37 members, not paid. 1 Howe gasol. eng. pump, 4 cylinder eng. triplex pump. 1 Waterson gasol. eng. pump can also be operated by hand. 2 hose Reels, 600 2½" canvas hose. 400 2" canvas hose. 1 H. & L. Truck.

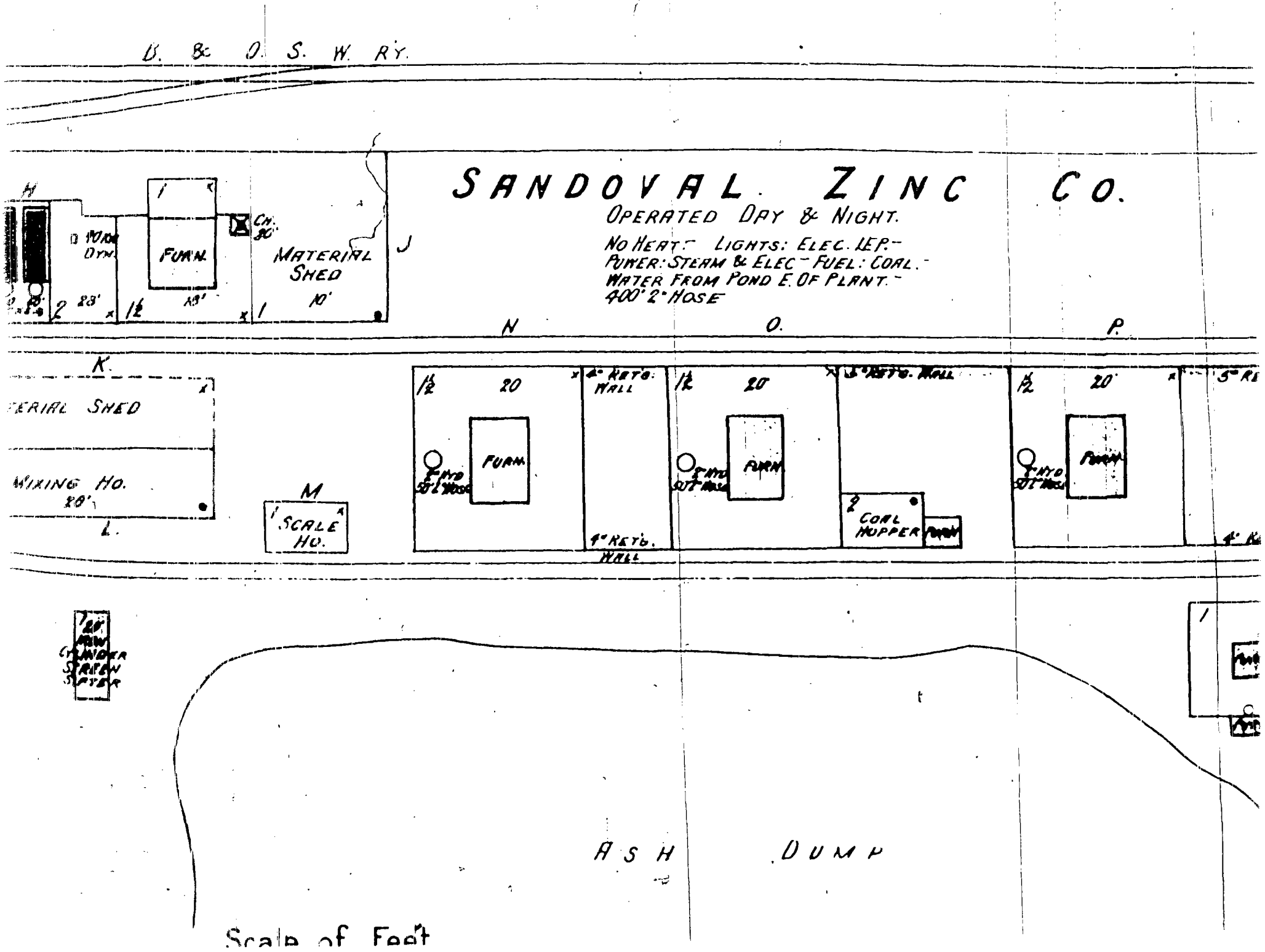
Grades: level. Streets: Not paved.
Public lights: oil lamps

SANBORN MAP COMPANY.
POPULATION 1800
PREVAILING WINDS S.W.
WATER FACILITIES SEE NOTE
TWO GASOL. & NO HAND ENGINE
TWO HOSE REELS
ONE HOOK & LADDER TRUCK
SANDOVAL
MARION COUNTY
ILLINOIS.
SCALE 50 FT. TO AN INCH.
JULY 1912
11 BROADWAY, NEW YORK.
COPYRIGHT, 1912, BY THE SANBORN MAP COMPANY.

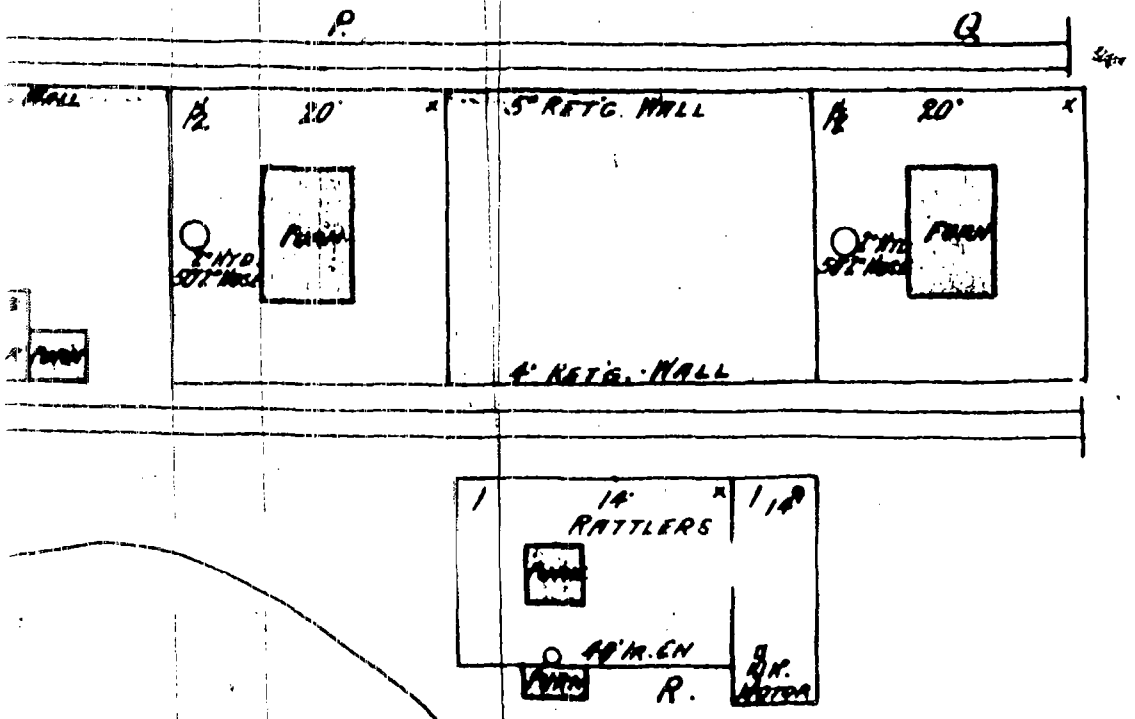


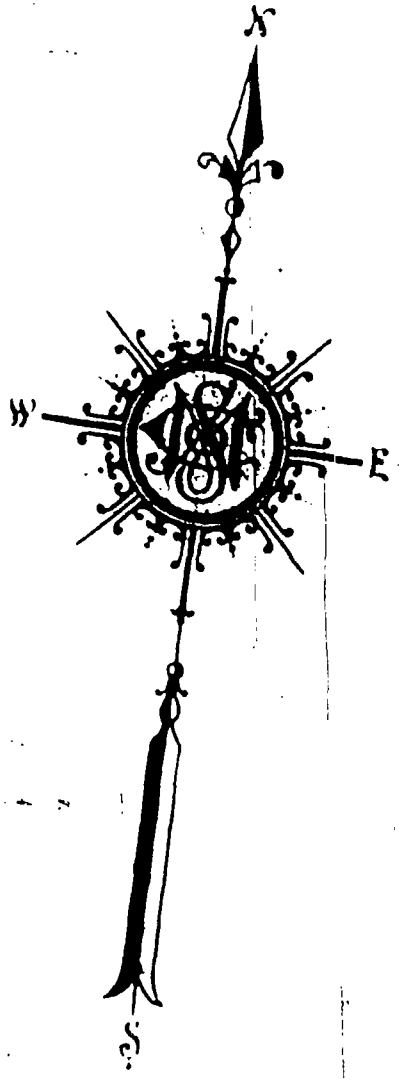


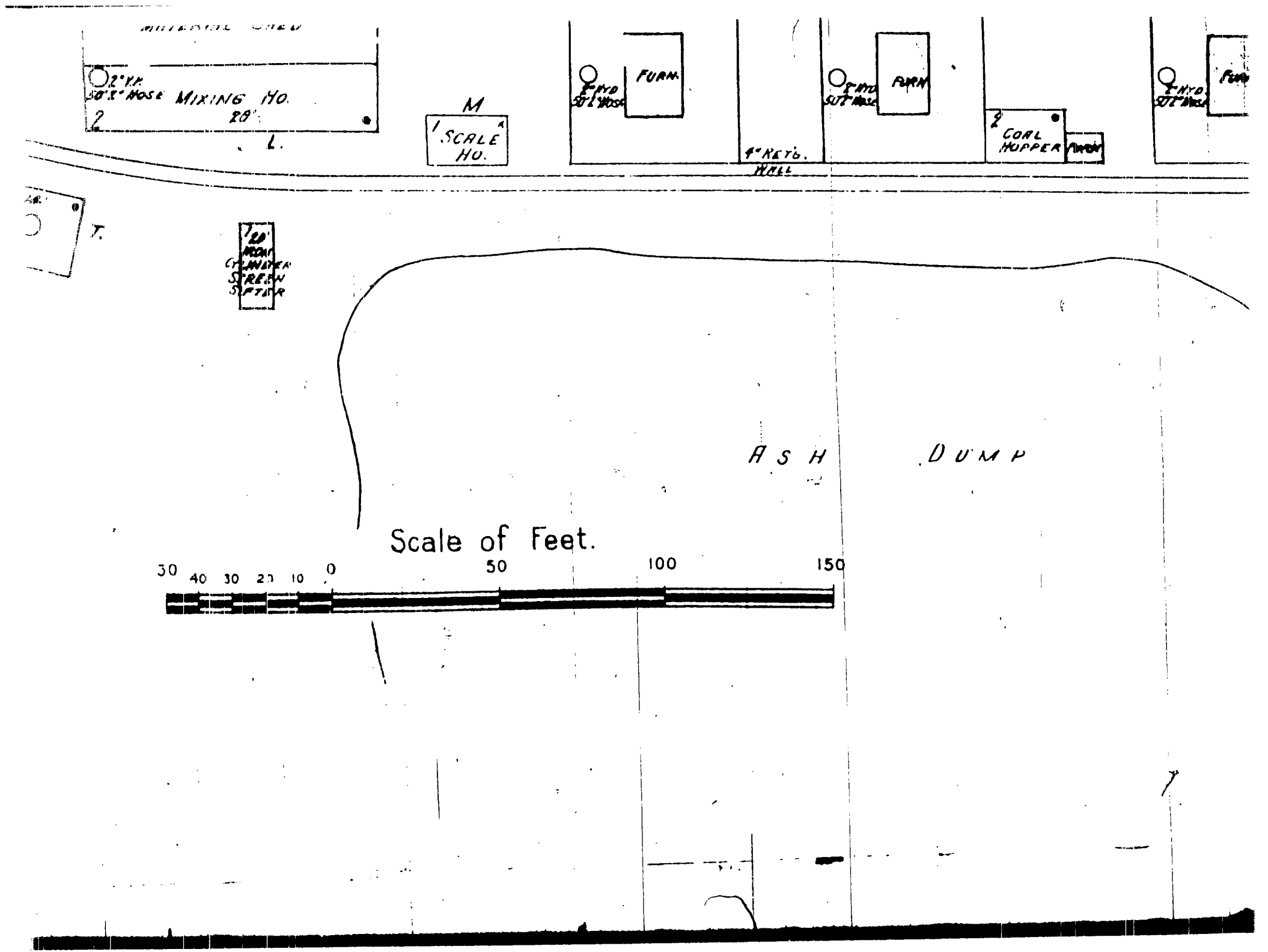
Located ½ Mile E of P.O.


U. & O. S. W. RY.
SANDOVAL ZINC CO.
OPERATED DAY & NIGHT.
NO HEAT. - LIGHTS: ELEC. I.E.P. -
POWER: STEAM & ELEC - FUEL: COAL. -
WATER FROM POND E. OF PLANT. -
400' 2" HOSE
H
I
J
K.
L.
M
N
O.
P.
FURN.
MATERIAL SHED
10'
MIXING HO.
20'
SCALE HO.
1/2
20
4" RET'G. WALL
COAL HOPPER
ASH DUMP
Scale of Feet

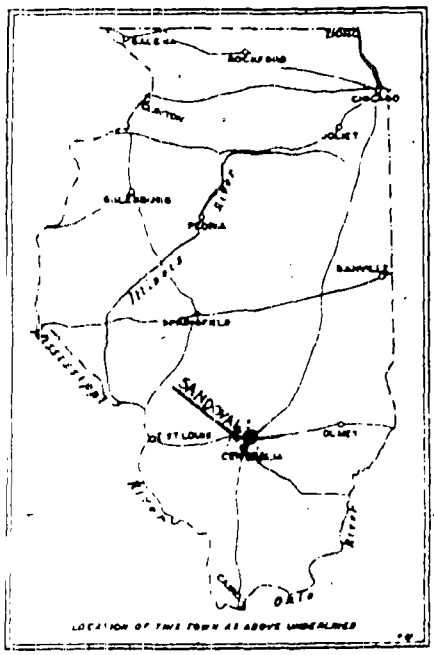
N C C O.






2" Y.P.
50'8" HOSE MIXING HO.
28'
L.
M
1 SCALE HO.
FURN.
4" KEYD.
WALL
CORL HOPPER
ASH DUMP
Scale of Feet.
30 40 30 20 10 0 50 100 150

4 SHEETS (CHIC.)



LOCATION OF THIS TOWN AS ABOVE UNDERLINED

SANBORN MAP COMPANY

POPULATION, 1500

PREVAILING WINDS, S. W.

FOR WATER FACILITIES AND FIRE DEPARTMENT, SEE REPORT.

SANDOVAL

MARION COUNTY

ILLINOIS

NOVEMBER, 1929

NEW YORK

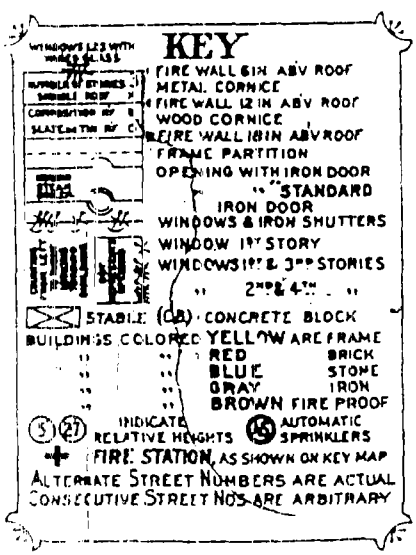
ROYAL ZINC CO.

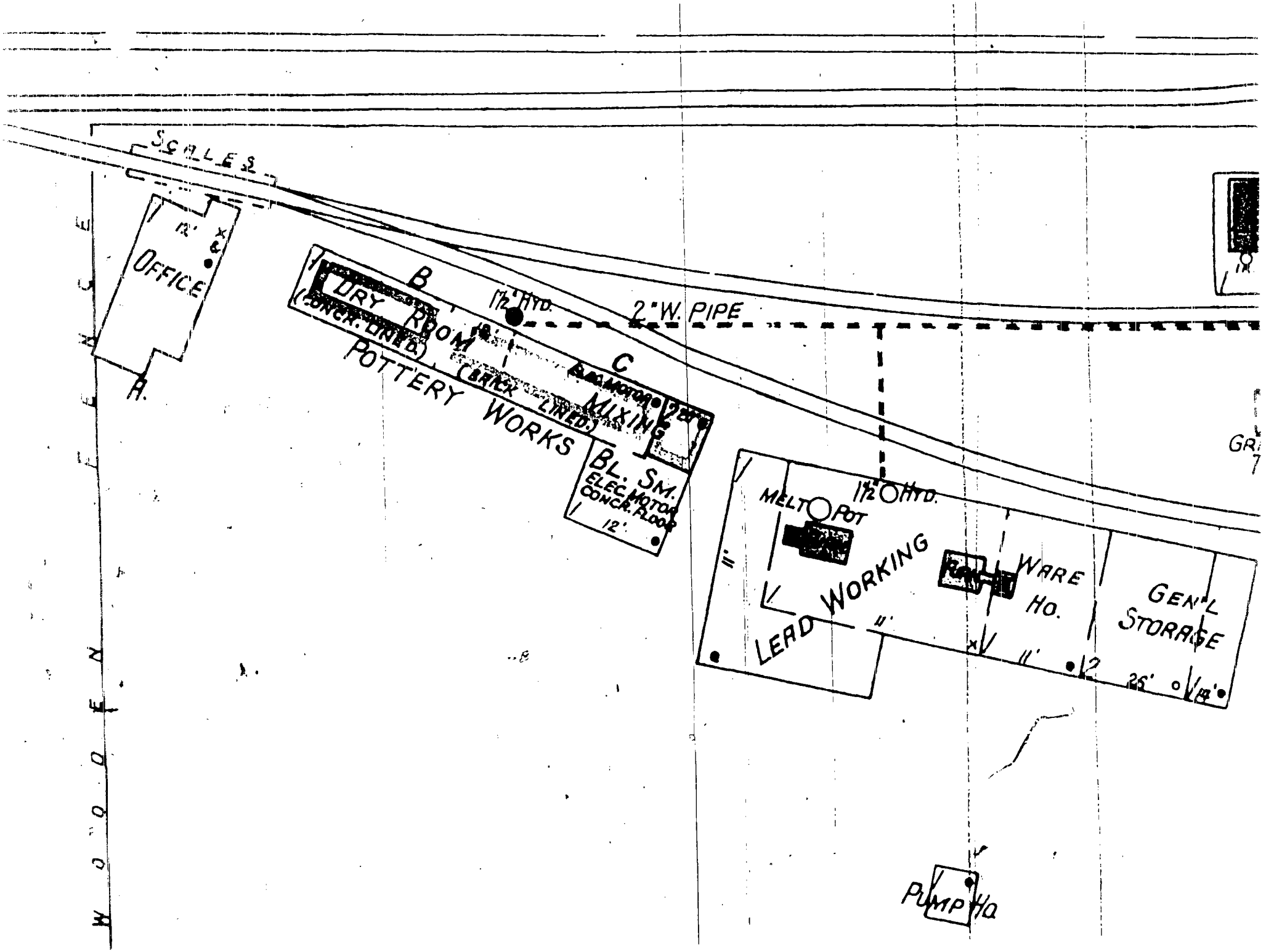
WATER FACILITIES:

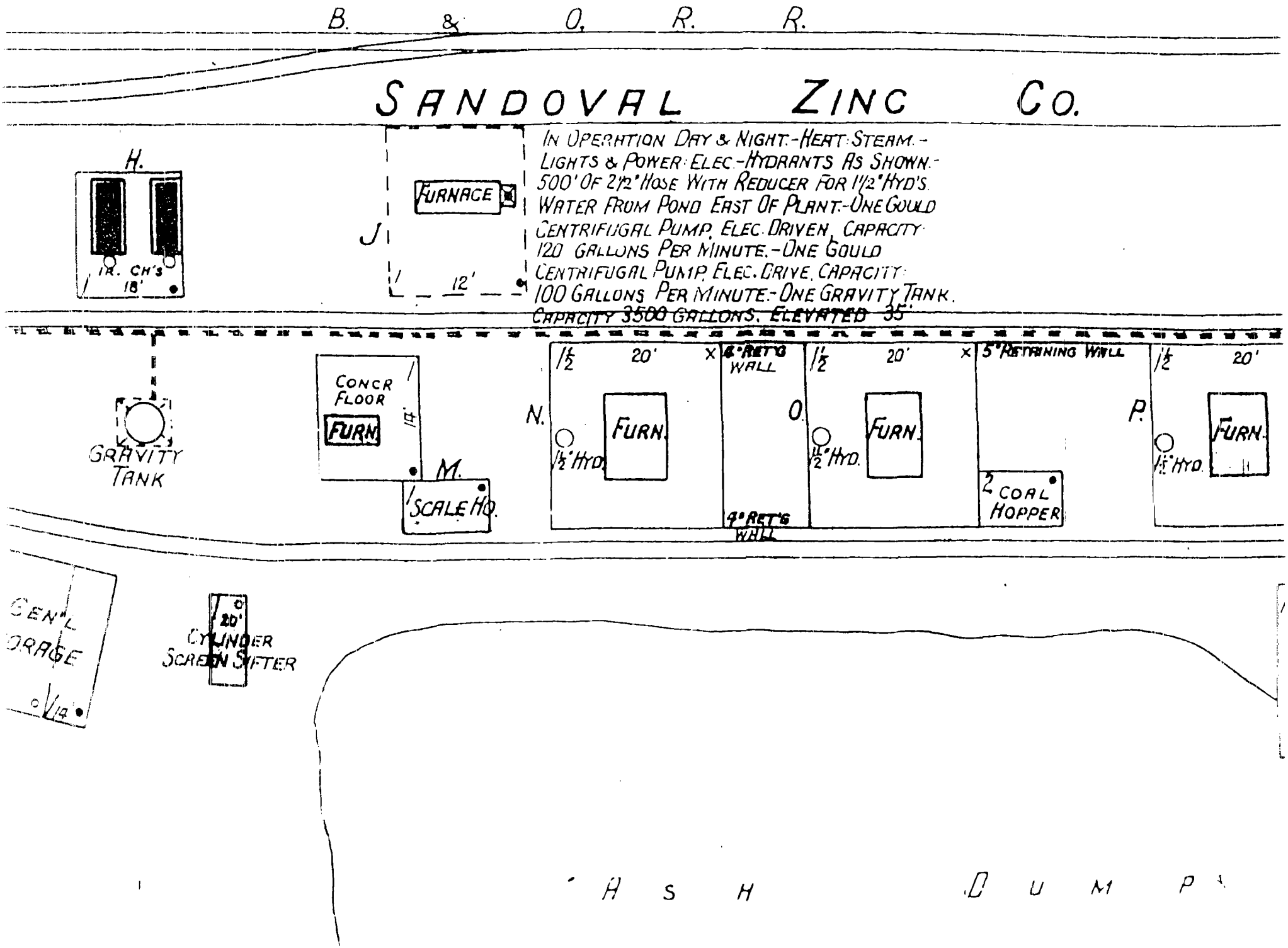
Wells and cisterns.

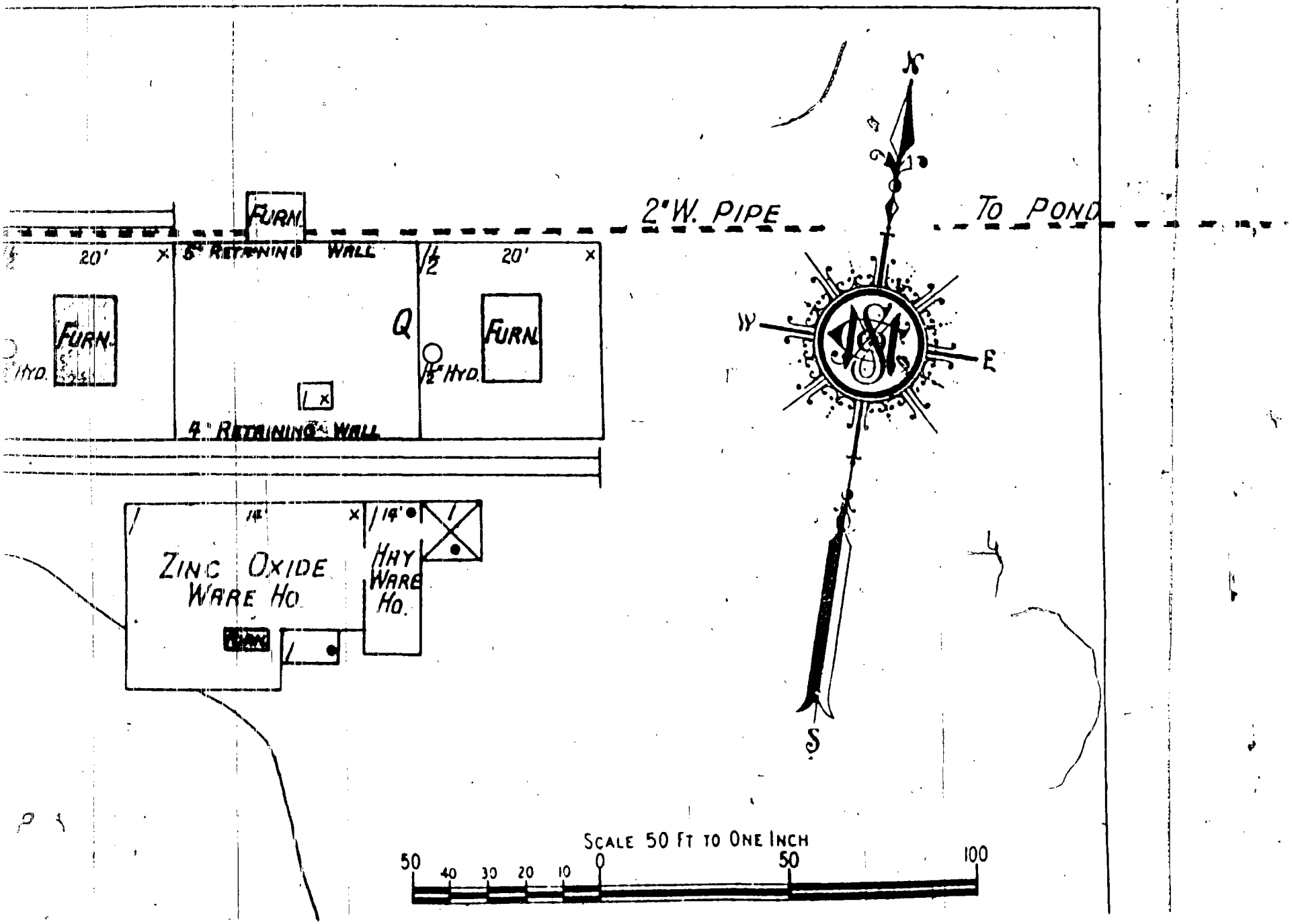
FIRE DEPT:

Volunteer.-1 chief and 26 men.-Two fire stations.-One Ford Model T, chemical truck, two 30 gallons chemical tanks, 150' chemical hose.-One Ford Model T, hose and pumper. Howe triplex pump, gasoline driven-900' of 2½" hose.-Fire alarm: telephone and siren.-
No fire resistive roofing ordinance.
No fire limits
Paving: 2 miles concrete.
Ground elevation: level.
Public lighting: electric




SCALES
OFFICE
A
B
DRY ROOM
(CONCR. LINED)
BRICK LINED
POTTERY WORKS
1½" HYD.
2" W. PIPE
C
MIXING
BL. SM.
ELEC. MOTOR
CONCR. FLOOR
MELT POT
LEAD WORKING
WARE HO.
GEN'L STORAGE
PUMP HO
WOODEN


B. & O. R. R.
SANDOVAL ZINC CO.
IN OPERATION DAY & NIGHT.-HEAT: STEAM.-
LIGHTS & POWER: ELEC.-HYDRANTS AS SHOWN.-
500' OF 2½" HOSE WITH REDUCER FOR 1½" HYD'S.
WATER FROM POND EAST OF PLANT.-ONE GOULD
CENTRIFUGAL PUMP. ELEC. DRIVEN. CAPACITY
120 GALLONS PER MINUTE.-ONE GOULD
CENTRIFUGAL PUMP. ELEC. DRIVE. CAPACITY
100 GALLONS PER MINUTE.-ONE GRAVITY TANK.
CAPACITY 3500 GALLONS. ELEVATED 35'
H.
IR. CH'S
18'
FURNACE
J
12'
GRAVITY TANK
CONCR FLOOR
FURN.
14'
M.
SCALE HO.
N.
1½
20'
FURN.
1½ HYD.
6" RET'G WALL
O.
1½
20'
FURN.
1½ HYD.
4" RET'G WALL
5" RETAINING WALL
2 COAL HOPPER
P.
1½
20'
FURN.
1½ HYD.
GEN'L STORAGE
20'
CYLINDER SCREEN SIFTER
ASH DUMP


FURN.
2" W. PIPE
TO POND
20'
8" RETAINING WALL
½
20'
FURN.
Q
FURN.
½" HYD.
½" HYD.
4" RETAINING WALL
14'
14'
ZINC OXIDE
WARE HO.
HAY
WARE
HO.
N
W
E
S
SCALE 50 FT TO ONE INCH
50
40
30
20
10
0
50
100

Appendix G

Health Assessment of Sandoval Zinc Co. and Blood Lead Levels in Children

PUBLIC HEALTH ASSESSMENT

SANDOVAL ZINC SITE

SANDOVAL, MARION COUNTY, ILLINOIS

CERCLIS NO. ILD 053980454

MAY 4, 1995

Prepared by

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

TABLE OF CONTENTS

SUMMARY

The Sandoval Zinc site is a 13-acre area situated southeast of Sandoval in Marion County, Illinois. It is currently an abandoned primary and secondary zinc smelter which located adjacent to a coal mining operation. Coal was the primary fuel used to fire the smelting furnaces (IEPA, Feb. 15, 1991). Primary production of zinc occurred at this site for approximately 5 years, from 1885 to 1890 (ISWS). The facility was converted to secondary smelting around 1915 and continued until 1985 (IEPA, Feb. 15, 1991). A fire occurred in the plant buildings on June 27, 1972, however the company rebuilt operations. Currently, the owners of the site have declared bankruptcy and have ceased all production as of December 19, 1986.

The former principal waste emissions from the operations were heavy metal laden cinders, air-scrubber sludge, and windblown ash. Surface water runoff and outfalls from these productions for most of this century have been contaminating nearby surface water, soil and sediments In addition, large quantities of the cinders were used in construction and surfacing secondary roads in the plant area and as fill material at the plant itself. It has been estimated that a layer of metal-rich cinders from 1 to 10 feet in thickness covers most of the site area.

Currently, the fenced portion of the site consists of two large buildings in various stages of deterioration, old storage tanks, debris, and small waste piles. A pond, several acres in size, is located east of the fenceline. Zinc contamination of area soils may contribute to problems maintaining groundcover and poor crops. The Illinois Environmental Protection Agency (IEPA) was alerted to potential problems at this site when the Illinois Department of Transportation was investigating areas adjacent to Highway 51 which they planned to widen. Nearby farming residents are concerned about contamination of their croplands and associated health effects.

The contaminants of health concern include antimony, arsenic, cadmium, chromium, copper, lead, manganese, nickel, thallium, and zinc. In addition to the potential heavy metal exposures experienced intermittently by village residents trespassing onto the site, past exposures likely included regular exposures to air emissions. Prior to and during site phase down activities, workers on the site may have been exposed to contaminants by inhalation and contact with contaminated surface soil and water. Wastes on-site are poorly isolated from the adjacent properties and can migrate onto nearby soils and surface water through runoff, especially during rainstorms or windy weather.

At this time, the Sandoval site is considered no apparent public health hazard. Although the environmental samples indicated that toxic heavy metals exist on and near the site, no data exist which demonstrate significant past or current exposures. Because of the persistent and cumulative nature of metals which remain in the site soils and nearby surface waters, exposures can potentially take place. The contaminant of greatest concern is lead. However, it is unlikely that young children would be exposed to on-site contamination. Most of the

other metals do not exceed health guidelines established for adults, the population gaining access to the property. Restrictions on public access to on-site areas need to be strengthened and strategies for minimizing migration of contaminated soils off-site need consideration. IDPH is considering implementation of a community health education program to inform residents on how they could reduce their exposure to contaminated soils and dust. Additional dust and soil samples should be collected from the nearest residences and day care facilities to determine the extent of the public health risk in this community posed by this old zinc smelter site.

BACKGROUND

The Sandoval Zinc site was on the state immediate removal list in Illinois in 1991. It is currently under review by Illinois Environmental Protection Agency (IEPA) and the site is being considered for future actions.

A. Site Description and History

Site Description

This abandoned facility is located southeast of the small town called Sandoval in rural southern Illinois (Figure 1).

The legal description of the site is:

> All that part of the east one-half (E 1/2) of the northeast one quarter (NE 1/4) of Section 17, township two north (T2N), range 1 east (R1E) of the third principal meridian, lying south of the right of way of the Baltimore and Ohio Southwestern Railroad, containing 13.17 acres more or less, situated in Marion County, Illinois.

The site is covered with cinder fill approximately 1 to 10 feet thick which supports only scattered vegetative growth. The metal-rich cinders from the former smelting operations covers most of the site's 13 acres. The artificial fill leveled the site's natural topography which is now relative flat, sloping only slightly to the eastern drainage ditch. At one time, smelting waste was used to surface secondary roads in the plant operations area and may have been used to establish railroad spurs.

Elevated levels of heavy metals have been identified in the surface soil throughout the site. This metal-rich fill has resulted in slight contamination of the site's underlying aquifer. Surface runoff from the site empties into drainage ditches outside the eastern and western fencelines (Figure 2). The ditches receive runoff from the fields north of the site via culverts built under the railroad tracks. The ditches divert water to the south marshy areas to the south, eventually emptying into Prairie Creek.

A 1-acre pond located east of the site may have been used for processing water for smelting operations or a reservoir for waste water. The pond contains fish. Tracks made by three-wheeled recreational vehicles and bicycles provided evidence that the site was frequented by visitors. The portion of the field located adjacent to the southern site boundary is grey in color and supports little vegetation. Neutralization (to reduce the acid content) of wastes using lime has been suggested in the past.

Currently the site is comprised of two large metal deteriorating buildings which contains some wastes, an abandoned railroad tank car, old furnace building ruins. Two large

The Illinois State Water Survey (ISWS) and the Illinois State Geological Survey (ISGS) conducted geologic and groundwater studies at the site from 1975 to 1982. The largest portion of the field work was conducted between July 1974 and April 1977. Forty-nine monitoring wells were installed on-site in 36 different locations during the study. The study was initiated to research the effectiveness of glaciated region soils in retaining toxic metals. The Sandoval Zinc site and two other secondary zinc smelters were included in the study. The main emphasis of the research project was to define the vertical and horizontal migration patterns of contaminants through the soil and shallow aquifer system, and to define the residual chemical buildup in soils in the vicinity of pollution sources. Although the focus of the study was on the retention of inorganic contaminants by glacial till, considerable data on depths of contamination, stratigraphy, and groundwater flow patterns were obtained. The study determined that 1 to 10 feet of fill had been placed over extensive areas of the site and with the scrubber waste water that cadmium, copper, lead and zinc had the deepest subsurface soil directly under the scrubber impoundment area. However, beyond the cinder fill and drainage ditches, the lateral and vertical migration was minimized probably due to the geologic makeup of the area (ISWS/ISGS, 1982).

The IEPA conducted a site investigation in September of 1986 and began to develop an R.I. in November of 1986. At that time, investigators observed hundreds of badly rusted drums and three transformers (two outside the rotary furnace shed and one near southwest corner of the site) littered the site.

In May 1990, an IEPA inspection of the site identified that the site was being used by a salvage company for storing recyclable materials (glass, plastic, cardboard, newspaper, and aluminum) and the dumping of demolition debris. The IEPA considered the site to be an immediate removal site as of February 1991. In February and March 1991, fires broke out in the debris stored on site and during both events the fires burned uncontrolled for several days. After attempts by IEPA to get the salvage company to cease its burning and dumping at the site failed, such an injunction was granted by the Illinois Attorney General's Office. On March 11, 1991, an injunction against the salvage company directed them to discontinue collection and management of recyclable materials at the site. A draft F.S. was developed by an IEPA contractor in March 1991. In April 1991, IEPA issued a seal order for the site and a fence surrounding the site was constructed in May 1991. In November 1991, a tank containing diesel fuel ruptured due to cold weather and approximately 200 gallons was deposited in an area near a tributary of Crooked Creek. Cold weather kept the spill congealed and the migration of the diesel fuel oil was minimized.

The pond to the east of the site's fenceline may be fished by individuals intermittently. Residents may also use the pond for swimming.

IEPA is currently evaluating the site to determine a clean-up strategy. A feasibility study is currently under review. It is unknown at this time if this site will be included on the state clear-up lists or referred to U.S. EPA.

C. Demographics, Land Use, and Natural Resource Use

Demographics

It is estimated that about 1,500 people live in Sandoval. Currently no one works at the site. At this time, it is not known how many people were employed during peak production. The nearest private residence is approximately two-thirds of a mile north/northeast of the site. Small businesses are approximately one-half mile from the site along Highway 51. A day care center is also located along with these commercial properties. The 1980 census reported a total population of 1,724 with a 11% decrease from 1980 to 1990. The 1990 census (based on 1989 information) gives the following information regarding residents of the Sandoval

Total population...	1,535
Hispanic origin	00007
Whites	1,520
Blacks	00002
Native Americans	00003
Asian and Pacific Islanders	00006
Residents Ages 0-4	00137
Residents Ages 5-9	00166

The following 1990 census housing statistics are reported from the village of Sandoval:

Total housing units	00588
Vacant housing units ...	00066
Owner-occupied housing units	00397
Rental units	00191
Housing units w/municipal water	00652
Housing units w/drilled wells	00000
Housing units w/dug wells	00001
Housing units with no phones	00120

The following 1990 census information is useful in assessing economic conditions of the community:

Housing units built after 1979	000126
Median year homes built ...	1963
Median value of housing units	$25,100
1989 median household income	$16,771
Persons 15 and over in poverty	000456

COMMUNITY HEALTH CONCERNS

According to staff at the Marion county health department, people living around the waste site are concerned about the lead and zinc contamination of their property. Larger landowners with land adjacent to the site are especially concerned about heavy metals which have migrated to croplands and their possible adverse effect on soybean plants.

Trespassers access the site on a regular basis and fences continue to be vandalized. Residents are concerned about older children and teenagers visiting the site.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables developed for this section list the contaminants of concern and are found in the Appendices. We evaluate these contaminants in the subsequent sections of the Health Assessment and determine whether exposure to them has public health significance. The IDPH selects and discusses these contaminants based upon the following factors:

1. Concentrations of contaminants on and off the site.

2. Field data quality, laboratory data quality, and sample design.

3. Comparison of on-site and off-site concentrations with background concentrations, if available. Generally, information is available for naturally occurring elements (metals).

4. Comparison of on-site and off-site concentrations with health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints.

5. Community health concerns.

In the data tables that follow under the On-Site Contamination subsection and the Off-Site Contamination subsection, the listed contaminant does not necessarily mean that the contaminant will pose a threat to public health. Instead, the list indicates which contaminants will be evaluated further in the Health Assessment. For the purposes of this health assessment, the sampling done inside the fenceline at the Sandoval site will be considered on-site contamination and the sampling done outside the fenceline (which includes the bordering drainage ditches and the eastern pond and sediments) are discussed under the off-site contamination subsection.

Compounds for which none of the above health comparison values exist will be considered as contaminants of concern and will be assessed in the remainder of the health assessment. Known or suspected human carcinogens will also be included if no cancer comparison value exists.

A. On-Site Contamination

Waste Materials and On-Site Soil Samples

Wastes and former product known to be generated, used, or stored at the site included smelting wastes, air scrubber liquids, coal cinders, and zinc oxide. On at least one occasion, diesel fuel was spilled onto the ground. Other chemicals, fuels, and process feedstocks were likely used and stored tanks and drums. One tank contains some fuel oil and was sampled on May 15, 1990. Organic constituents of toluene (4.4J ppm), ethylbenzene (20 ppm), and xylenes (96 ppm) were detected in the oil sample. Inorganic elements of iron (41 ppm), lead (28 ppm), nickel (17 ppm), vanadium (49 ppm), and zinc (20 ppm) were detected in the oil sample.

Inorganic waste is the principal concern at this site. Therefore, most samples were analyzed for total metals. Some samples were also analyzed for E.P. toxicity. The E. P. toxicity test was a procedure which leached out heavy metals from the environmental sample by using an acid. The resulting liquid is then analyzed for dissolved metals. This method of extraction was designed to emulate what occurs at some landfills. The E.P. toxicity for material identified as process waste was reported to exceed the EP toxicity standards for aluminum, cadmium, chromium, copper, lead, and zinc. This process waste is located inside on-site buildings. These buildings are not tightly closed or locked, but do appear to contain wastes and keep them dry.

Cinders are spread thickly over the surface of the site and were also used in area road and railroad beds. Therefore, it is difficult to determine if the existing data reported from the on-site "soil" is truly soil or process waste used as fill. The laboratory results from the solid media collected on-site are presented in Table 1.

Some small mounds of smelting waste still exist near the retort furnace, but the larger part of the site has been graded. The liquid scrubbing waste collection area was not believed to be lined or contained other than a berm around the perimeter of the ponded area. Dried sludge was collected and sold to fertilizer manufacturers. In the mid-1980s, four samples of the old impounded area were collected from this spot long after the standing water had evaporated. Some metals were detected from this sampled area at concentrations of concern (see Table 1). Today no perennial surface water exists on-site (inside the fenced area).

Off-Site Soils and Sediments

Most of the data reviewed in this section are from the banks and sediments from the drainage ditches around the periphery of the site and are included in Table 2. All metals listed on Table 2 were detected over an existing soil comparison value except for mercury. The drainage ditches were sampled in 1986, 1987, and 1990 for a total of nine samples. The metals found in the drainage ditch soil and sediments over an ATSDR soil comparison value include: antimony, arsenic, barium, cadmium, chromium, manganese, nickel, silver, and zinc in at least one sample. Nineteen metals exceeded the background concentrations.

Metals found at concentrations above comparison values in off-site soil samples (not associated with the drainage ditches) include antimony, arsenic, barium, cadmium, chromium, manganese, mercury, nickel and zinc. Lead and copper were detected above background levels in off-site surface soils but do not have soil comparison values.

Limited data is available regarding site-related wastes which has been transported off-site or migrated to properties not adjacent to the site. Waste which appears to be generated by smelting operations may have been transported off site to unknown locations to be used for fill, roads and drives or perhaps area rail lines. Dried sludge from the facility scrubber was sold to fertilizer companies, however, it is not known if significant contamination occurred during transfer or via end consumer use since no records or other data exist regarding this use of waste products.

In 1987, the Illinois Department of Agriculture collected soil samples about 3/4 mile northeast of the site from a soybean field. Two surface soil samples (less than six inches deep) were analyzed for lead (70.7 ppm and 62.7 ppm) and zinc (highest value 404 ppm). Cadmium and arsenic were not detectable in the soil samples. No other off-site surface soil samples from adjacent private properties or from the nearest residence in Sandoval are known to exist.

Off-Site Surface Water

In the past, scrubber wastes were collected on site and could have been considered on-site surface water. Baghouse dust and floor sweepings were added to the impounded sludge and from time to time, these by-products would be collected and sold to fertilizer manufacturers. However, presently, there is no standing water inside the fenceline, therefore all surface water data will be considered off-site for discussion purposes. The site is bordered to the east and west by drainage ditches. Culverts have been constructed through the railroad berm to the north of the site and direct water from the fields north of the site past the site's east and west perimeters to swampy areas south of the site and towards Prairie Creek, 1/2 mile south of the site.

On the southeast portion of the site, an area appears to be cutout from regular runoff drainage which leads into the ditch to the east adjacent to the fence. The western drainage

C. Quality Assurance and Quality Control

In preparing this Public Health Assessment, IDPH on the information provided in the referenced documents and assume that adequate quality assurance and quality control measures were followed with regard to chain-of-custody of samples, laboratory procedures, and data reporting. The analyses and conclusions in this Health Assessment are valid only if the referenced information is complete and reliable.

Future investigations and sampling will be amended to this Public Health Assessment to characterize current site conditions.

D. Toxic Chemical Release Inventory

In addition to the review of currently available data pertaining to off-site contamination, a search was conducted of the U.S. EPA Toxic Chemical Release Inventory (TRI) for the site and local area (Sandoval and Centralia) in June 1994 (U.S.EPA, 1993). This database contains voluntarily reported information on environmental releases from active industrial facilities. This information is provided to give a general idea regarding emissions from manufacturing facilities which may be contributing an additional environmental burden to a potential population of concern.

No TRI data was reported for the Sandoval area (Zip Code Area 62882) and the TRI data for Centralia was primarily organic releases. The only contaminants reported from the Centralia area were barium and zinc. Centralia is located 4 miles south of Sandoval. It does not appear that the Sandoval Zinc site has been affected by releases from any currently operating facility which report to the TRI.

E. Physical and Other Hazards

Combustible conditions have existed and fires have occurred when large volumes of cardboard and newspaper were stored at the site. Presently, a large diesel fuel tank stores oil at the site. The site has been graded and attempts at restricting access with chain-link fencing has had only partial success as vandals continue pull the fence apart even following costly repairs. Some portions of the cyclone fence are posted with warning signs. Many of these signs have been defaced with bullet holes. A large double-wide gate at the southwest corner of the site is padlocked. However, many gaps in the fence do exist and trespassers may access the site along railroad right-of-way, as well on the east and west borders.

Trespassers could fall from high loading platforms or be harmed by loose building structures and siding Inside and outside the fence the ground is littered with glass and protruding nails from old construction debris. Old rusted metal components are distributed throughout the site. A large empty tank is located outside the fence and trespassers could easily fall into it. The farm pond is also outside the fence and the possibility of drowning does exist.

B. Potential Exposure Pathways

No workers are currently employed at the site. In the past, workers' families may have been exposed to fugitive dust and particles in personal vehicles or on work clothing.

Since the site is closed, trespassers are more likely to frequent the site. Dust from the site could be picked up by older children playing on the site and brought home to a younger sibling. Waste residues finding their way into homes can be ingested by preschool children as hands and toys are frequently placed into their mouths.

Although process air emissions ceased, windborne particulates may continue to contaminate nearby properties adding to the solid wastes deposited earlier. Ingestion of food crops grown in contaminated soil may be a pathway of concern.

The on-site surface waste remains the source material for continued off-site and on-site migration and mixing into surface soils. High winds may cause on-site wastes and soils to become airborne dust. This airborne migration could be especially problematic for the large uncovered highly contaminated on-site wastes which are surrounded by farm fields and residential properties. Rain can cause these bare on-site wastes to become surface water runoff since much of the site is poorly covered with vegetation. These erosion mechanisms are a particular concern with the high concentrations of nonessential highly toxic metals in the contaminated environment. Additionally, acidic conditions at this site may contribute to metal mobility and solubility.

Surface water runoff from weather events may wash metals off-site onto roads, surrounding properties, and into nearby drainage ditches and marshes or may percolate through contaminated sources, leaching to subsurface soils and groundwater or perhaps eventually discharging to surface water. Perennial standing surface water in the area includes the drainage ditches, marshes, a large pond and a creek south of the site. It is not known if individuals wade, swim, fish, or hunt in or around the ditches, creeks, or pond or how frequently these activities may occur. There are no inlets to community water supplies in the area which draw from area surface water.

Ingestion of surface water is not believed to be a pathway of concern at this site. It is not known if individuals using these waterways for drinking or swimming. The type and prevalence of use of the larger receiving water body, Prairie Creek, is not known.

Direct contact with remaining contaminated soils and sediments in the ditches or may occur to individuals who may wander into this area to wade or fish. If water fowl or mammals are feeding on species supported by this potentially contaminated shallow water area, hunters may be exposed to toxic metals which can accumulate in animals.

It is not likely that any individual is currently receiving regular exposures from this site which would result in doses exceeding current health guidelines. Therefore, it is unlikely that any health effects listed below would occur in Sandoval residents solely due to intermittent visits to the site being made by teenagers and adults.

Antimony

The health guideline for antimony is USEPA's chronic oral RfD of 0.0004 mg/kg/day. Assuming that ingestion of the antimony in contaminated on-site soil is an individual's only exposure source, the soil concentrations that would result in an exposure of 0.0004 mg/kg/day would be 0.8 ppm for a pica child, 20 ppm for a child, and 280 ppm for an adult. The values for the pica child and the non-pica child are included for comparison on Tables 1 and ingestion doses included on Table 7. Antimony concentrations in the Sandoval samples reviewed exceed soil comparison values in on- and off-site soils and sediments. The highest concentration in on-site soil for antimony is 210 ppm. Using this value, pica children visiting the site and ingesting 1/2 gram of soil each day would exceed the health guideline. Also, non-pica children ingesting 200 milligrams of on-site soil would exceed this guideline. The off-site soils and sediments were generally ten times less concentrated.

Four of six surface water samples were approximately the same as the ATSDR child RMEG for drinking water, 4 ppb. The USEPA antimony standard for surface water is 146 ppb and no Sandoval surface water sample exceeded this value. Groundwater samples were not analyzed for antimony.

Antimony can irritate eyes, skin, and lungs. Long-term, high dose exposures can cause heart problems, vomiting, and diarrhea. It is not known if antimony can cause cancer in humans.

Since young children are not known to frequent the site, it is unlikely that this site would result in adverse health effects because of site-related antimony exposure in this population. The adult health guidelines were not exceeded for antimony.

Arsenic

Adverse health effects associated with arsenic are most notably that it is a known human carcinogen if appropriate doses are inhaled. No current or past air data for arsenic is available for this site. The arsenic health comparison values used in this health assessment are derived on ingestion as the primary route of exposure.

An oral Minimum Risk Level (MRL)(for non-carcinogenic effects) of 0.0003 mg/kg/day has been developed by ATSDR for chronic arsenic exposure. The soil guidelines based on the oral RfD are 20 ppm for an adult, 10 ppm for a child, and 0.6 ppm for a pica child. The highest concentration of arsenic in site-related wastes was estimated to be 26 ppm from the

The chronic oral MRL for cadmium is 0.0007 mg/kg/day. Cadmium concentrations of 1.0 ppm for a pica child, 40 ppm for a child, and 500 ppm for an adult are estimated to result in a daily exposure equal to 0.0007 mg/kg/day. The highest cadmium concentration in on-site waste was found to be 110 ppm. However, since children are not knoen to frequent the site, it is unlikely that this site would result in adverse health effects because of site-related chronic cadmium exposure in this population. The adult health guidelines were not exceeded.

While data regarding ambient airborne concentrations of cadmium are not known to exist, inhalation exposures almost certainly occurred to past workers and currently continues, although in lower concentrations and intermittently when cadmium-contaminated wastes and soils become airborne. Inhaled cadmium affects the body in the same way as ingested cadmium.

Chromium

There are several forms of chromium in the environment including chromium III and chromium VI. Chromium III is the naturally occurring form and is an essential nutrient. Chromium VI is usually associated with industrial activities. Chromium analysis in both air and soil samples did not differentiate between chromium III and chromium VI. The comparison values used in this section will be based on chromium VI.

The comparison values for chromium VI in soils (based on a chronic oral RfD of 0.005 mg/kg/day) are 10 ppm for a pica child and 300 ppm for a child and are included on Table 1.

The typical background soil levels range from 1 to 1000 ppm. No site-specific background soil concentrations were determined for Sandoval. The highest chromium concentration measured in the waste product materials was 1360 ppm and 98 ppm in the on-site soil. The highest off-site soil/sediment concentration (39.1 ppm, see Table 2) was found in the east drainage ditch in 1986.

No chromium was detected in surface water above the drinking water RMEG of 50 ppb (for chromium VI), however two monitoring well samples were measured at 69 and 150 ppb.

Long-term exposure to elevated chromium levels in the work place has been associated with lung cancer. Chromium VI seems to be at least one form of chromium that is associated with lung cancer, while chromium III has not been associated with lung cancer. No air data exists for this site. Dermal exposure in allergic individuals may cause redness and swelling of skin.

The health effects associated with the chromium concentrations in any sampled medium would not be expected to cause any problems in the general population.

Adults can experience health risk following chronic lead exposures, too. Some studies have indicated that elevated blood lead levels in middle-aged males may increase their risk of developing hypertension. It has also been suggested that lead may aggravate osteoporosis in post-menopausal women when bone lead stores are released by the demineralization processes.

Because lead accumulates in the human body and because it is necessary to minimize exposures especially to young children, lead is typically a contaminant of concern at many hazardous waste sites and urban areas. However, it remains unclear as to the degree to which lead in soil (as well as other common and uncommon sources) contributes to a child's overall common daily lead intake.

As mentioned earlier, no health comparison values have been determined for lead in soil, but USEPA has a Maximum Contaminant Action Level of 15 ppb for municipal drinking water supplies. Background soil samples collected from the Sandoval area were found to be 10-40 ppb. The highest on-site soil concentration value is 69,600 ppm found in the old scrubber liquid impoundment area. If trespassers were to ingest lead-contaminated soil, it would almost certainly add to the individual's lead body burden.

Manganese

Manganese in on- and off-site soils exceeded the comparison value for a pica child. No background soil samples were analyzed for manganese. The ranges for the typical soil levels of manganese are included in Tables 1 and 2. The chronic oral soil RfD guideline of 0.14 mg/kg/day is not likely to be exceeded by adults intermittently visiting the site.

The health effects associated with the ingestion of manganese may include weakness, stiff muscles, trembling of hands. Yet manganese is believed to be necessary for maintaining health. Since manganese is a naturally occurring element, exposure occurs every day. The amount in the normal diet is between 2,500-5,000 mg/day. It is not known to cause cancer if ingested.

Again, since this site is infrequently visited, it is unlikely that manganese doses causing adverse health effects would occur.

Nickel

The routes of exposure to nickel would be either airborne from the site or ingestion of nickel that has been deposited in soil. Background nickel levels in area soils were not measured but common ranges for nickel concentrations in soil are from 5-500 ppm. The highest concentration of nickel was found in a sample from the on-site soils (25,000 ppm). If an individual ingested this concentration of nickel on a regular basis for a long period of time, the oral RfD guideline would be exceeded; however, such ingestion is unlikely.

Zinc is an essential nutrient. The health effects associated with zinc are non-carcinogenic. The health effects from breathing high levels of zinc in the work place include breathing difficulties and may cause a brief sickness called metal fume fever. Ingestion of too much zinc can cause anemia and digestive problems. Excessive zinc intake may also be associated with an increased risk of heart disease and trouble in fighting disease or infection.

B. Health Outcome Data Evaluation

No health outcome data from the state registries has been generated at this time.

C. Community Health Concerns Evaluation

No public meeting concerning this site has been held. The acting director of the Marion County Health Department has had no specific complaints from the community of Sandoval, however the county health department is only one year old. One of the nearest residents contacted the state regional office in 1987 regarding zinc and lead detected in surface soils on their farm.

Question: What health effects are associated with lead exposure?

Response: The principal target organ in lead exposures is the central nervous system, especially in young children. Lead is associated with learning disorders and lowered cognitive abilities. Lead is stored in the bone of the body for long periods of time. The bones themselves are not affected, but the lead can be mobilized later during physiologic stresses such as pregnancy, surgery, and or injury. Other organs also store lead such as the liver and kidney.

Question: Are the private wells north of the site contaminated?

Response: These wells were sampled for metals in the mid 1980s. Copper, magnesium, manganese, silver, and zinc were detected in one well. Silver and manganese were above current drinking water standards. It is not known if any area private wells are now being used for potable water. The IDPH will recommend that the functional private wells used for drinking water be tested for the wastes found at the site.

Question: Can excessive concentrations of heavy metals have deleterious effects on soybean crops?

Excessive amounts of zinc have been known to stress vegetation. The site and adjacent properties to the south of the site have very scattered growth of ground cover and other vegetation.

3. Blood lead analyses of area residents should be reviewed to determine if excessive exposures are occurring. Encourage Sandoval parents to comply with state regulations concerning blood lead testing of preschool children. Review existing and future blood lead data to determine if an excessive prevalence of elevations exists.

4. A private well survey and heavy metal sampling should be conducted of the private wells closest to the site. A survey of the existing monitoring wells should be completed to determine which wells should be closed.

Health Activities Recommendations

1. Restrict public access to on-site areas.

2. Implement procedures to suppress dust generation and migration if any on-site removal/remedial operations, or demolition activities occur.

3. Where areas of significant off-site contamination are identified, consider strategies for minimizing exposures to site-related contaminated soils on private properties.

4. Consider implementing an on-going community health education program to inform residents on how they could reduce their exposure to contaminated soils and dusts.

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APPENDIX A. Tables

Table 2. Summary of Sandoval Inorganic Contaminants in Off-Site Waste Materials, Soils, and Sediments in ppm.

Contaminant (CAPS = CONTAMINANT OF CONCERN)	Concentration Range									Comparison values		
	1985 east ditch, n=2	1987 & 1990 east ditch		1987 west ditch		1990 pond sediments		1986 & 1990 off-site surface soils		Background[1]/common soil ranges[2]	ATSDR[3]	
		n	range	n	range	n	range	n	range		Soil	Source
Aluminum	-,-	4	4733-18000	3	5029-7020	3	8560-13600	7	6750-13600	10000-300000	NONE	
ANTIMONY	14,14	4	nd-1.6J[5]	3	0.27-0.5			8	nd-30	1-9	0.8/20	RMEG
ARSENIC	7,13	4	16-26J	3	nd-15	3	7.6-20	8	5.3-20	1-50	0.6/20	RMEG
Barium	-,-	4	71-157	3	54-84	3	72-300	7	89-300	100-3000	100/4000	RMEG
CADMIUM	27.2,26.6	4	13-24	3	1.5-7.4	3	nd-8.2	8	nd-14.2	.041.5/0.01-0.7	1/40	EMEG
CHROMIUM	39.1,18.1	4	18-41	3	11-25	3	nd-22	8	nd-23.5	1-1000	10/300 (VI)	RMEG
Copper	1240,418	4	252-1065	3	38-688	3	330-1010	8	nd-1010J[4]	10-30/2-100	NONE	
LEAD	7560,1590	4	15-2200	3	140-1026	3	190-2200	8	71-15000	10-40/2-200	NONE	
MANGANESE		4	260-1390	3	88-503	3	270-2770	7	240-2770	20-3000	300/7000	RMEG
Mercury	0.36,0.04	4	0.08-2.5	3	0.04-0.18	3	nd-0.83	8	nd-9.43	0.01-0.3	4/100	EMEG
NICKEL	570,14.4	4	117-716	3	5.4-287	3	180-490	8	nd-490	5-500	40/1000	RMEG
Silver	3.1,0.8	4	nd-2.5	3	1.1-1.6	3	nd-46	8	2.5-46	0.01-5	10/300	RMEG
THALLIUM	3,3	4	nd-0.61	3	nd-0.41	3	nd-nd	8	nd-2	0.3-0.7	NONE	
ZINC		4	4863-24230	3	507-13700	3	1080-150000	8	1080J-360000	20-25/10-300	600/20000	RMEG

[1]Background soil 3 miles south/southwest (ISWS/ISGS, 1982).
[2]Common range for soils [based on Clarke and Washington (1924), Swaine (1955), Vinogradov (1959), Jackson (1964), Bowen (1966), Mitchell (1964), and Taylor (1964)]
[3]Comparison values for pica/nonpica children.
[4]J indicates a laboratory estimated value.

Table 4. Summary of Sandoval Inorganic Contaminants Analyzed in Groundwater in ppb.

Contaminant (CAPS = CONTAMINANTS OF CONCERN)	Contaminant Ranges			Comparison Values[1]	
	6/29/90 2 wells (01,02 installed 6/90)	6/90 3 wells (101,102,103 installed 4/87)	6/90 one residential well	Values - Drinking Water	Source
Aluminum	14000,13000	nd,nd,nd[2]		NONE	
ANTIMONY				4/10	RMEG
ARSENIC	17,16	nd,nd,nd		3/10	EMEG
Barium	160,250	nd,nd,nd		700/2000	RMEG
CADMIUM	45,6	nd,nd,nd	nd	7/20	EMEG
CHROMIUM (total)	150,69	nd,nd,nd		50/200 (VI)	RMEG
Copper	64,47	nd,nd,nd	35	1300	MCL
LEAD	29,34	nd,nd,nd	nd	15	MCL
MANGANESE	1500,1400	nd,nd,380	160	50/200	RMEG
Mercury	nd,nd	0.2,nd,nd		20/70	EMEG
NICKEL	41,nd	nd,nd,nd	nd	200/700	RMEG
Silver	140,11	43,420,450	66	50/200	RMEG
THALLIUM	nd,nd	nd,180,190		2	MCL
ZINC	280,200	nd,nd,nd	88	3000/10000	EMEG

[1]ATSDR comparison values for child/adult or U.S. EPA Maximum Contaminant Levels for Drinking Water (MCLs).
[2]nd = non detectable value

Table 6. Potential Exposure Pathways - Sandoval Zinc

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATIONS	TIME
Process Wastes	Scrubber impoundment	Sale of process waste (Fertilizer)	Commercial application	Ingestion Food	Fertilizer customers/consumers	Present Past Future
Surface Water	Site surface waste Contaminated Soil Contaminated Sediments	Surface runoff	East and west ditches/marshes and east pond	Ingestion	Waders Swimmers Fishermen	Past Present Future
Surface Soil	Surface wastes Airborne deposition Surface water	Off-site soil	Adjacent private properties	Inhalation Ingestion	Neighbors	Past Present Future
Vegetables	Contaminated soil	Contaminated biota	Gardens and crops	Ingestion	Gardeners Farmers	Past Present Future
Sediments	Contaminated soil Surface water Surface runoff Air deposition	Sediment receiving settling contaminants	Creeks	Ingestion	Fishermen Hunters Waders	Past Present Future
Ambient air	Surface contamination	Particulate	Site or neighboring properties	Inhalation	Residents Trespassers	Present Future
Fish	Contaminated sediments and water	Game fish Game animals	Homes	Ingestion	Gardeners Fishermen Hunters	Past Present Future

APPENDIX B. Figures

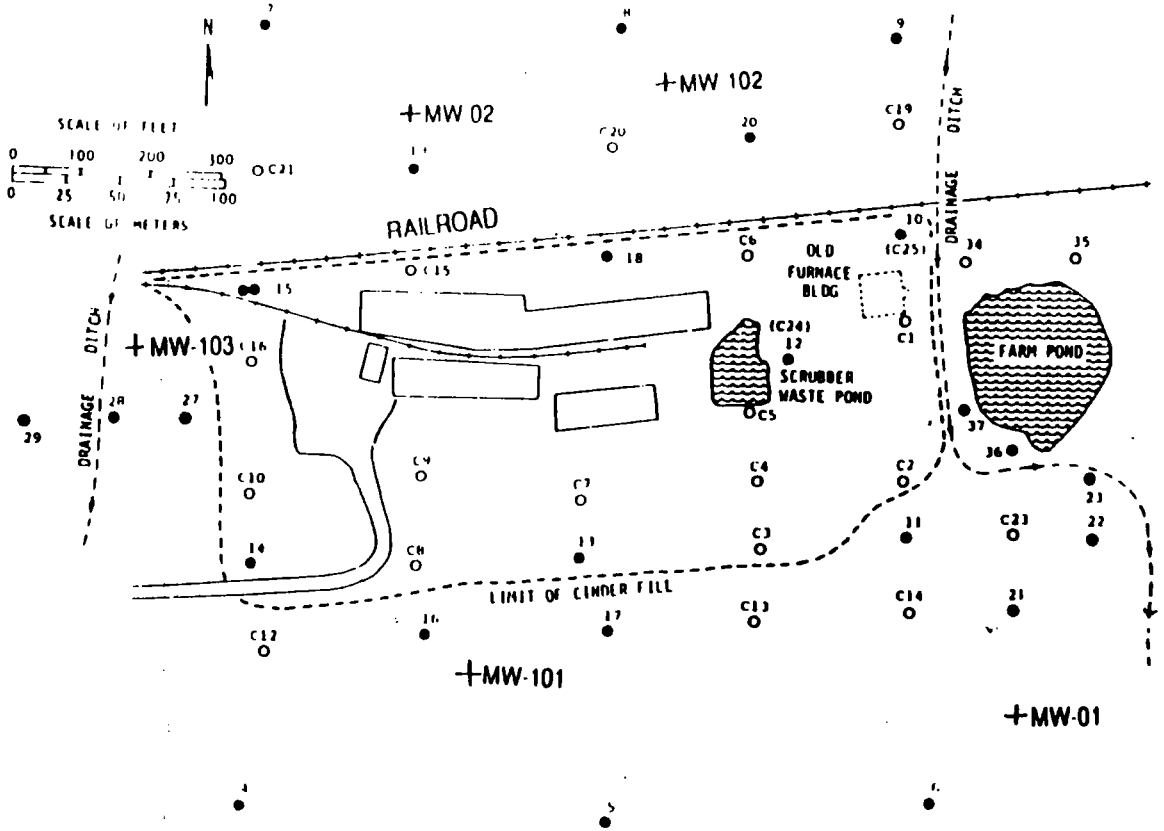

Figure 2. Sandoval Site Features

Key

c o ISWS Core Hole
● ISWS Abandoned Well
MW monitoring well

MARION COUNTY HEALTH DEPARTMENT

M E M O R A N D U M

To: **Interested Parties**

From: **Linda Slater, RN, Marion County Health Department** LS RN

Date: **September 10, 1996**

Subject: **August 23, 1996, Lead Screening at Sandoval**

On August 23, 1996, the Marion County Health Department held a special lead screening clinic at the Children's Activity Center in Sandoval, Illinois. This clinic was held because the Environmental Protection Agency declared Sandoval as a "Superfund" site, due to the old Smelter Plant located on Highway 50.

A total of 33 children were tested. All test analyses are complete, with no children showing a high level of lead in their blood. Of the 33 children tested:

1 - child tested at a level of 7.

1 - child tested at a level of 6.

3 - children tested at a level of 5.

22 - children tested at a level of less than 5.

6 - children tested at a level of less than 3.

In conclusion, it should be noted that none of the children tested exhibited a lead level of 10 or above.

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